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**Qionghua Chen**

*The First Affiliated Hospital of Xiamen University, China*

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## Advances in Obstetrics and Gynecology Research

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# Uterine Torsion Due to Uterine Fibroid in Non-Pregnant Women: A Case Report

Yuri Kim, Young Mi Ku\*, Yoo Dong Won

Department of Radiology, Bucheon St. Mary's Hospital, College of Medicine, Catholic University Korea, Bucheon 14647, Korea

\*Corresponding author: Young Mi Ku, [ymiku@catholic.ac.kr](mailto:ymiku@catholic.ac.kr)

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**Abstract:** Uterine torsion is a rare gynecological emergency. It occurs mainly in gravid uterus and extremely rarely in non-gravid uterus. In this article, we report a case of torsion of non-gravid uterus accompanied by a large intramural leiomyoma with focus on computed tomography and magnetic resonance imaging.

**Keywords:** Uterus; Leiomyoma; Torsional abnormality

**Online publication:** May 5, 2023

## 1. Introduction

Uterine torsion is defined as a condition in which the uterus is rotated more than 45 degrees around its longitudinal axis. Uterine torsion is very rare, occurring primarily in pregnant women and even more rarely in non-pregnant women. The clinical presentation of uterine torsion may vary from asymptomatic to mild abdominal discomfort to acute abdominal pain with shock<sup>[1]</sup>. These non-specific symptoms and the rarity of the disease may lead to a delayed diagnosis of uterine torsion, which, if left untreated, may lead to irreversible ischemic damage to the uterus, resulting in infertility, life-threatening hemorrhage, and shock. Early diagnosis and surgical treatment are therefore necessary<sup>[2]</sup>. We present a case of uterine torsion with uterine fibroid in a 60-year-old non-pregnant woman reported by computed tomography (CT) and magnetic resonance imaging (MRI).

## 2. Case report

A 60-year-old female patient presented to the outpatient clinic with pain in the lower abdomen that suddenly occurred the preceding day.

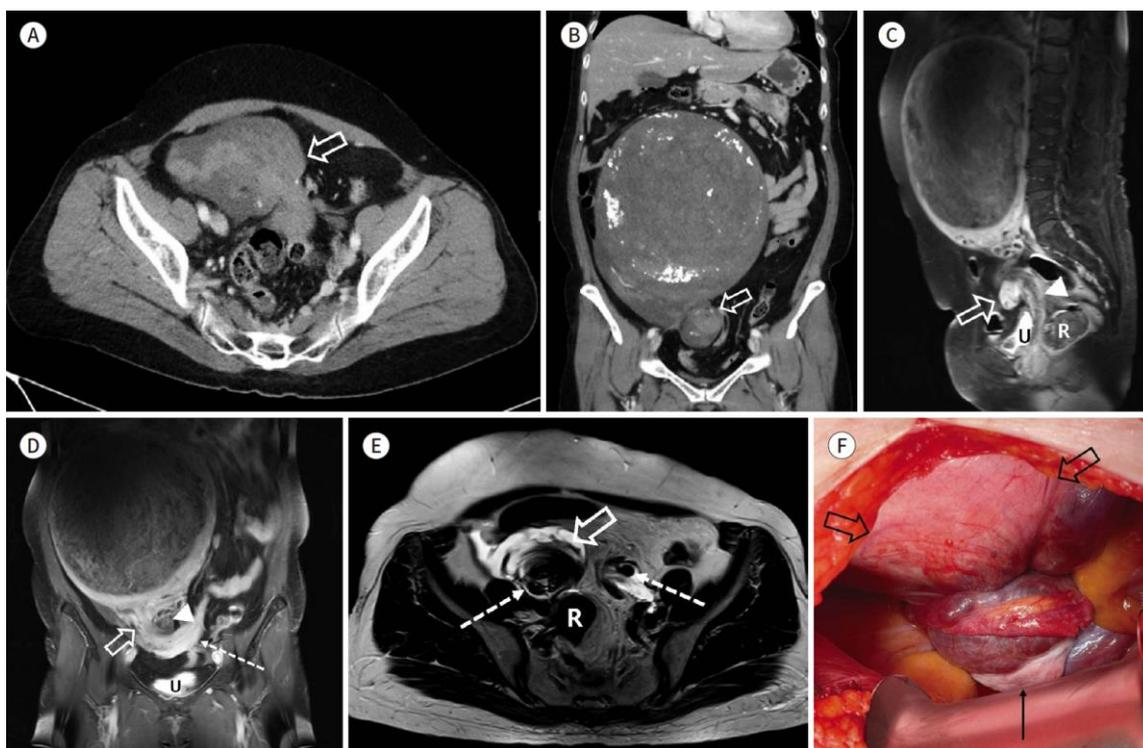
On CT, a uterine mass of approximately 20 cm in size was observed, and she was referred to the hospital. The patient had an intrauterine device inserted 26 years ago after a spontaneous miscarriage and attained menopause 4 years ago. She reported that her abdominal mass had been palpable for the past 10 years, but it was not accompanied by pain. She had not sought medical attention for it. On physical examination, abdominal distension was observed, a mass of approximately 20 cm in size was palpable, and there was generalized abdominal tenderness. On vaginal ultrasound, a large mass was observed in the pelvic cavity, and bilateral ovaries were not well observed.

On a contrast-enhanced abdominal CT taken at another hospital, a mass of approximately 21 cm × 23 cm × 16 cm in size was observed in the abdominal cavity. This mass was connected to the cervix and received blood supply from the uterine vessels. Vortex sign (whirlpool sign) was observed between the

mass and the cervix. There was no contrast enhancement inside the mass, although multiple calcifications were present. Bilateral ovaries were clear.

A small amount of ascites was observed in the abdominal cavity (**Figure 1A–B**). An intrauterine device was observed at the lower part of the mass. For detailed evaluation of the mass, pelvic MRI was performed in our hospital. The mass was well-demarcated and inhomogeneously hypointense on T2, moderately or hypointense on T1, and inhomogeneously contrast-enhancing on T1. A vortex-like structure was observed inferiorly to the mass, and it was connected to the upper part of the cervix (**Figure 1C–E**). The uterine body was not clearly observed. These findings were suspicious of torsion of the uterine body due to leiomyoma within the wall of the uterine floor. The ovaries on both sides were not clearly observed on CT, and the ovarian vessels crossed the vortex structure, leading us to consider the possibility that the ovaries on both sides were twisted together (**Figure 1D–E**).

The patient underwent total abdominal hysterectomy with bilateral salpingo-oophorectomy. Surgical findings showed a mass of approximately 22 cm in size with clear boundaries in the uterine floor, and the uterus was rotated 360 degrees clockwise. The bilateral adnexa were also twisted (**Figure 1F**). Pathological examination confirmed the mass to be a uterine fibroid, without any bleeding or infarction. No abnormal findings were observed in the adnexa bilaterally. The patient was discharged without postoperative complications.



**Figure 1.** A 60-year-old female with torsion of myomatous uterus. (A) Axial and (B) coronal reformatted contrast-enhanced computed tomography (CT) images showing a well-defined large heterogeneous abdominopelvic soft tissue mass with calcifications, representing intramural leiomyoma in the uterus. Note the whirlpool sign (arrows) in the inferior aspect of the mass, connected to the cervix and a small amount of fluid around the mass. (C) Enhanced sagittal and (D) coronal T1-weighted images showing a huge intramural leiomyoma at the uterine fundus and extended uterine cervix (arrowheads). Note the whirlpool sign (arrows) between the leiomyoma and the cervix and involved left ovarian vessel (dashed arrow). (E) Axial T2-weighted image showing a whirlpool sign (arrow), representing twisted uterine corpus. Both ovarian vessels (dashed arrows) are involved in the whorled structure. (F) Intraoperative image showing an enlarged uterus with a huge mass (open arrows), rotated 360 degrees on its long axis at the level of the lower uterine segment. Note the normal appearance of the ovary (arrow) involved in the twisted pedicle. Abbreviations: R, rectum; U, urinary bladder.

This case report was exempted from written informed consent by the Institutional Review Board (IRB approval number: UC22ZASI0052).

### 3. Discussion

Uterine torsion is a very rare condition that has been reported mainly in pregnant women and very rarely in non-pregnant women. It occurs mainly at the isthmus of the uterus between the cervix and the uterine body, where the cervix and surrounding ligaments are stretched. The degree of torsion usually ranges from 45 to 180 degrees, although up to 720 degrees has been reported [3]. Non-pregnancy causes of uterine inflammation include leiomyomas, congenital anomalies of the uterus, pelvic adhesions, and adnexal masses [1,4,5]. Symptoms of uterine torsion are highly variable and non-specific, ranging from asymptomatic to abdominal pain, vaginal bleeding, digestive and urinary system symptoms, and even shock. When uterine torsion occurs, lymphatic and venous congestion of the uterus occurs; if the torsion persists, the arteries eventually become compressed, causing ischemic damage and necrosis of the uterus, and if the ovaries are involved, they may also be damaged. Uterine torsion is a gynecological emergency that can be life-threatening and infertility-causing if diagnosed late, but due to its non-specific clinical presentation and rarity, it is difficult to make a diagnosis of uterine torsion preoperatively. This condition is often discovered at the time of surgery. Differential diagnoses include appendicitis, secondary degeneration of fibroids, torsion of intrapelvic masses, and ectopic pregnancy.

Imaging modalities for the diagnosis of uterine torsion include pelvic ultrasound, CT, and MRI. On pelvic ultrasound, uterine inflammation should be suspected if there is a change in the position of a previously known fibroid [6], and if the ovaries are involved, color Doppler studies may show the ovarian vessels crossing the uterus abnormally [1]. However, pelvic ultrasound is limited in terms of identifying uterine torsion when fibroids are large. CT is the primary test used in women presenting with acute abdominal pain in the emergency department, and MRI can be helpful in preoperative diagnosis due to its high soft tissue resolution and contrast, which allow for accurate evaluation of the organs in the pelvis. The most characteristic and common findings on CT and MRI in the diagnosis of uterine torsion are vortex structures in the isthmus or cervix [1,4]. The predisposing factors of uterine torsion, such as intrapelvic masses and uterine malformations, can be identified on CT and MRI, while ischemia and infarction of pelvic masses can be demonstrated with contrast [4]. In addition, gas in the uterine cavity may suggest necrosis of the uterine wall due to uterine torsion [2]. An X-shaped appearance at the upper vagina on axial MRI images has been reported to be helpful in the diagnosis of uterine torsion [7], but it may not be seen depending on the location or extent of the torsion.

The treatment of uterine torsion is surgery. In patients who wish to preserve fertility, surgery is performed to release the torqued uterus and remove the cause, provided there is no uterine necrosis. Hysterectomy is performed in postmenopausal women when the condition has progressed to uterine necrosis or when thrombosis is present. Salpingo-oophorectomy may also be performed if bilateral adnexa are involved [6]. In conclusion, uterine torsion can lead to life-threatening complications and infertility if diagnosis is delayed, so it is important to be suspicious of uterine torsion in acute abdominal pain in women with predisposing factors for uterine torsion, such as large fibroids or uterine malformations, as well as to understand the findings of uterine torsion on imaging in order to ensure early diagnosis and treatment.

### Disclosure statement

The authors declare no conflict of interest.

## Author contributions

*Conceptualization:* Young Mi Ku

*Supervision:* Young Mi Ku

*Writing – original draft:* Yuri Kim, Young Mi Ku

*Writing – review & editing:* Young Mi Ku, Yoo Dong Won

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# Exposure to Pesticides in Pregnant Women: An Integrative Review

Thayná Champe da Silva<sup>1\*</sup>, Maria Goreti Finkler<sup>2</sup>, Letícia Słodkowski<sup>2</sup>, Jaíne Gabriela Frank<sup>2</sup>, Poliana Ribas Tolfo<sup>2</sup>, Dioneia Dalcin<sup>3</sup>, Iara Denise Endruweit Battisti<sup>2</sup>, Zelia Caçador Anastácio<sup>4</sup>

<sup>1</sup>UniLaSalle, Lucas do Rio Verde 78455-000, Mato Grosso, Brazil

<sup>2</sup>Federal University of Fronteira Sul (Universidade Federal da Fronteira Sul, UFFS), Cerro Largo 89815-899, Rio Grande do Sul, Brazil

<sup>3</sup>Federal University of Santa Maria (Universidade Federal de Santa Maria, UFSM), Santa Maria 97105-900, Rio Grande do Sul, Brazil

<sup>4</sup>Research Centre on Child Studies, University of Minho (Uminho), Braga 4710-057, Portugal

\**Corresponding author:* Thayná Champe da Silva, thaynachampe@hotmail.com

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**Abstract:** *Background:* Considering the development model adopted in Brazilian agriculture, which is based on the increasing demand for chemicals, studies that analyze the impact of pesticide use are relevant to measure the developments in affected populations. *Objective:* The aim of this study was to conduct a literature review using the digital platform, searching for scientific publications from 2009–2019 on exposure of pregnant women to pesticides. *Methods:* We used PubMed to search for scientific articles published between January 1, 2009, and December 31, 2019, and related to exposure of pregnant women to pesticides in rural areas. *Results:* Initially, 207 publications were selected considering the titles and abstracts. Literature works that did not meet the inclusion criteria were excluded. After selection, 15 studies remained. According to the publications on the exposure of pregnant women to pesticides in rural areas from 2009 to 2019, it was found that the damage caused by pesticide exposure to the health of pregnant women and their babies includes problems in gestational weight gain, premature birth, low birth weight, presence of pesticides in blood of both mother and newborn, presence of agricultural pesticides in the cerebral cortex of fetus, and miscarriages. *Conclusion:* Future prospective studies at individual level are needed to better assess the potential impact of pesticide exposure on the health of pregnant women and newborns.

**Keywords:** Agrochemicals; Pregnant women; Maternal and child health

*Online publication:* May 15, 2023

## 1. Introduction

The Green Revolution in the 1950s brought about the emergence of new technologies and the modernization of agricultural processes. These technologies include pesticides, chemicals intended to control diseases, and vectors to increase productivity <sup>[1]</sup>. Brazil began using the nomenclature “agrototoxic,” instead of “defensive pesticide,” to designate agricultural poisons, after a great mobilization of civil society to underline the toxicity of these products to the environment and human health <sup>[2]</sup>.

Pesticides are used for crop production and to control vector-borne diseases in urban areas. They are potentially toxic to other organisms, including humans <sup>[3]</sup>. Human exposure to pesticides can occur environmentally, through air and consumption of food and water, as well as occupationally, during or after

indoor/outdoor application [2].

Research on the impact of pesticide use on human health is still lacking considering the extent of chemical load of occupational exposure and the extent of damage to health, resulting from the extensive use of these chemical compounds, and due to the lack of information on consumption of pesticides and insufficient data on poisoning by these products [4].

In Brazil, men are generally responsible for the application of pesticides; they tend to perform this activity in the company of their family and often without the use of personal protective equipment (PPE) [5].

Since women believe they are only helping around, they are more exposed to the risks of activities that promote handling and/or exposure to chemical agents without proper protection [6]. Therefore, more attention must be paid to pregnant women, who are characterized as a risk population. Research focuses on the complications in pregnancy, constituting an emerging concern in healthcare and highlighting the risks that vulnerable populations, such as pregnant women, are exposed to [7].

Undesirable outcomes of pregnancy, such as low birth weight, prematurity, and congenital malformations, are risk factors of infant mortality. In turn, such adverse outcomes may be influenced by various other factors during pregnancy, such as malnutrition, stress, smoking, use of illicit drugs, and exposure to chemical substances. Among the chemical substances that may cause these adverse outcomes, pesticides stand out. Studies in humans remain contradictory, but they indicate a higher risk of these outcomes in newborns whose mothers were exposed to pesticides during pregnancy [8].

Studies have shown that a number of pesticides can affect the reproductive system of animals and embryo-fetal development after intrauterine exposure, among which congenital malformations (CM) are highlighted [9]. When considering the development model adopted in Brazilian agriculture, which is based on the growing demand for chemicals, studies that analyze the impact of pesticide use are relevant to measure the developments in affected populations. Thus, the aim of this study was to conduct a literature review using the digital platform, searching for scientific publications concerning the exposure of pregnant women to pesticides in the period 2009–2019.

## 2. Methodology

This study used PubMed to search for scientific articles published between January 1, 2009, and December 31, 2019, and related to the exposure of pregnant women to pesticides in rural areas.

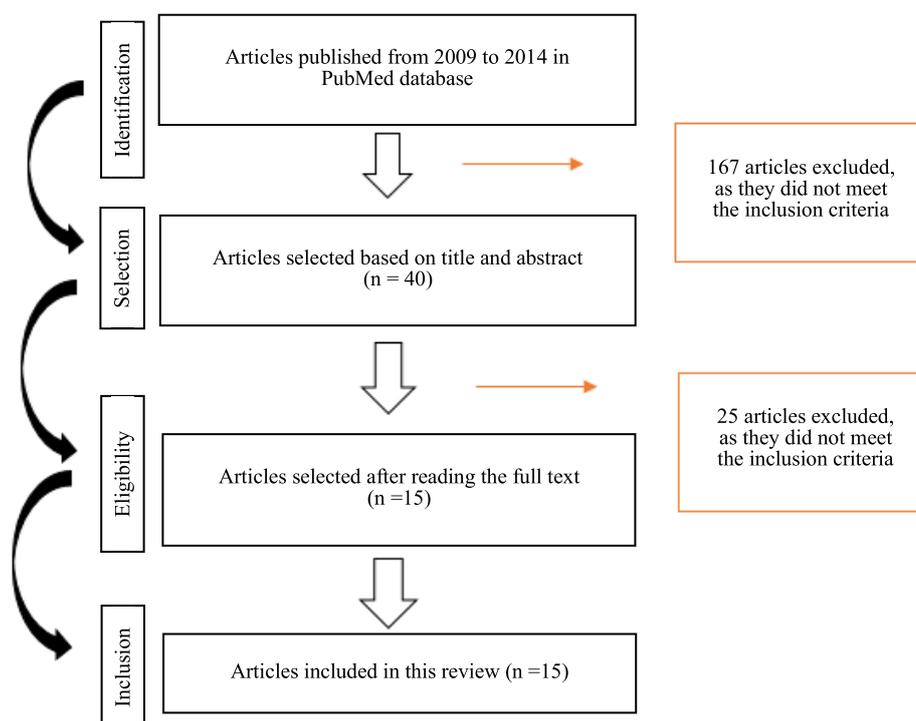
Studies were selected by searching PubMed (<https://www.ncbi.nlm.nih.gov/pubmed/advanced>) using the following keywords in English, Portuguese, and Spanish: (pesticide OR herbicide OR insecticide OR fungicide OR organophosphate OR carbamate) AND (rural population OR non-urban OR rural areas OR rural area OR rural) AND (women OR woman OR wife OR pregnancy OR prenatal OR gestation).

Inclusion criteria: original articles that presented the relationship of pesticides and pregnant women in rural settings published between 2009 and 2019. Exclusion criteria: (i) studies related to pregnant women in urban areas; (ii) studies that did not analyze the relationship between pesticides and pregnant women; (iii) review articles; (iv) studies that analyzed the intake of pesticides through food; (v) genetic studies; (vi) non-English, Portuguese, or Spanish articles; (vii) studies that were not fully available.

## 3. Results and discussion

Initially, the selection of publications was performed considering the titles and abstracts to exclude publications that did not fit the inclusion criteria. Of the 207 articles found, 167 were excluded, as they were unrelated to pregnant women and pesticides, written in languages besides English, Portuguese, or Spanish, focused on the use of pesticides in residences to combat malaria and/or vectors in combating possible diseases, and not fully available. Twenty-five articles were further excluded, as they were unrelated

to exposure of pregnant women to pesticides in rural areas and dealt specifically and only with exposure of children. After the screening, 15 studies remained. **Figure 1** illustrates the article selection process.



**Figure 1.** Article selection process

Of the 15 articles selected, only one was carried out in Brazil, being retrospective, exploratory, and descriptive in nature. In the study, Motta *et al.* [10] evaluated the rate of metal and pesticide contamination in pregnant women, relating it to perinatal outcomes, in the rural area of Botucatu, São Paulo, Brazil; they analyzed blood samples from 40 mothers and their newborns; the results indicated that there was no statistically positive correlation ( $P > 0.05$ ) between maternal contamination index and clinical parameters of newborns as well as the contamination index of newborns and their clinical parameters.

Although the exposure to pesticides, involved in the different stages of agricultural production, among the rural population is through direct contact with products, understanding the full exposure scenario aids in identifying other important routes of exposure and populations at risk [11]. In addition to health risk factors to which pregnant farmers are subjected during the management and application of pesticides, there is risk to their relatives and other people living around agricultural areas as well as people who consume food and water with high concentrations of these chemicals. Certain groups of people, such as children, pregnant women, women of childbearing age, the elderly, and sick individuals, are more vulnerable to pesticide exposure and have a higher probability of developing adverse health effects; therefore, these groups deserve special attention [12].

Kongtip [13] carried out a study on prenatal exposure to organophosphorus pesticides, which may lead to developmental neurotoxicity. Organophosphate metabolites in maternal urine were measured at 28 weeks of pregnancy ( $n = 86$ ), delivery ( $n = 67$ ), and 2 months after delivery ( $n = 51$ ). Labor, household, and behavioral factors that were potentially associated with pesticide exposure were investigated by a questionnaire survey. Samples of urine were collected and analyzed for dimethyl phosphate (DMP), diethyl phosphate (DEP), diethylthiophosphate (DETP), and diethyldithiophosphate (DEDTP) using gas chromatography mass spectrometry. Urinary DMP concentrations at 28 weeks of pregnancy and delivery were not significantly different, but DMP concentrations at 28 weeks of pregnancy and DAP concentrations

at delivery were significantly different from those at 2 months after delivery. Factors influencing urinary concentrations of DMP at 28 weeks of pregnancy included insecticide use at home, proximity to agricultural land, frequency of visits to agricultural fields during the first and second trimester of pregnancy, occupational activity of the participants, pesticide use, and other agricultural activities. When genetic and geographic variables (residence near pesticide application) were analyzed, the highest risks were among newborns with exposures to both, indicating a 2-to-4-times higher chance of developing hypospadias, a congenital malformation of the male external urogenital tract.

According to Ding *et al.* [14], pyrethroid insecticides are widely used, and little is known about the possible adverse effects on fetal growth. The study was on 454 mother-infant pairs in the northern region of China between September 2010 and 2012. Five non-specific metabolites of pyrethroids were measured in maternal urine at the time of delivery and examined for association with birth outcomes, including weight, length, head circumference, and gestation length. No association was found between individual or total levels of metabolites and infant length, head circumference, or gestational length, although an inverse association of prenatal exposure to pyrethroids, as measured by urinary metabolites, with birth weight was reported.

Elserougy [15] detected the transfer of organochlorine pesticides (OCPs) through placenta and breast milk in healthy lactating mothers in urban/rural areas. The study involved 38 healthy participants undergoing caesarean delivery. Sociodemographic data, maternal serum, and umbilical and adipose tissue samples were collected. The samples were analyzed for OCP residues. Olindane, p'-dichlorodiphenyldichloroethane (DDD) in maternal serum, dichlorodiphenyltrichloroethane (DDT) and p'-dichlorodiphenyldichloroethylene in umbilical serum were the only residues detected at significantly higher frequencies and/or averages in primigravidae.

The total amount of DDT residues in umbilical cord serum was significantly higher in rural mothers. The detection of OCPs in mothers suggests the possible placental transfer to the child during pregnancy and lactation and may reflect the persistence or recent use of these pesticides in the environment.

Sharma *et al.* [16] studied pesticide residues in the breast milk of nursing mothers living in Punjab. A total of 127 samples of breast milk were analyzed, and pesticide residues were detected in 25% of the samples. About 10 mL of milk was collected in a sterile glass bottle prewashed with acetone and taken to the laboratory under refrigerated conditions. The residue levels were observed to decrease with increasing age of the mother, and the residue levels were higher in rural population than in urban population, although no statistically significant difference was found between the two. The low levels of organochlorines indicated the effectiveness of the ban on their use as well as the increased demand for synthetic organophosphates and pyrethroids. The presence of organophosphates requires additional monitoring in future studies.

The overall exposure process in the agricultural environment fluctuates with periods of higher and lower exposure but is continuous. The exposure of children starts in intrauterine life, when most of these compounds pass through the placenta and, after birth, through mother's milk during breastfeeding. The excretion of organochlorines in milk is an important means of reducing maternal body burden, and there is a transfer of these compounds to the infant during breastfeeding. The contamination of breast milk attracts certain attention as milk is the only source of food for newborn infants, who consume proportionally large amounts of it [17].

OCPs persist for long periods, but little is known about plasma OCP levels in pregnant women. Therefore, a study was carried out to determine the exposure concentrations in a sample of pregnant women in Western Australia and the environmental factors, lifestyle, and activities that contribute to maternal exposure to OCPs as well as to compare maternal exposure concentrations with those measured in other countries. In this cross-sectional study on 167 pregnant women, located in rural and urban Western

Australia, their blood plasma was collected, and they were required to complete a questionnaire on lifestyle, demographics, and determinants of exposure to OCPs [18].

Organophosphate pesticides are widely used. Recent studies have suggested associations of exposure to these compounds *in utero* with adverse birth and neurodevelopmental outcomes. Few studies have characterized organophosphorus pesticides in human plasma and established how these levels correlate with urinary measurements. We measured organophosphate pesticide metabolites in urine as well as chlorpyrifos and diazine in maternal plasma and bone marrow of individuals living in agricultural areas to compare the levels of two different biological matrices. We also determined paraoxonase 1 genotypes (PON1-192 and PON1-108) and specific PON1 substrate activities in mothers and newborns to examine how PON1 can affect the measurements of organophosphorus pesticides in blood and urine [19].

The levels of chlorpyrifos in plasma ranged from 0 to 1,726 ng/mL, since non-zero levels were measured in 70.5% and 87.5% of maternal and cord samples, respectively. Diazine levels were lowest (0–0.5 ng/mL) in 33.3% of maternal plasma and 47.3% of umbilical cord plasma.

Logistic regression was used to analyze the relationship between atrazine exposure and preterm birth, which was controlled for maternal age, race/ethnicity, education, smoking, and prenatal care. An increase in the odds of preterm birth was found in women living in counties included in the group with the highest exposure to atrazine, compared to women living in counties included the group with the lowest exposure, while controlling for covariates. Analyses using the three exposure assessment approaches demonstrated odd ratios ranging from 1.20 (95% CI: 1.14–1.27) to 1.26 (95% CI: 1.19–1.32) for the higher exposure group compared to the lower exposure group [20].

In a study by Jaacks *et al.* [21], urinary concentrations of pesticide markers in early pregnancy (less than 16 weeks gestation) were investigated, and the association of these concentrations with preterm birth, low birth weight, and dwarfism at approximately 1 and 2 years of age was estimated; 3,5,6-trichloro-2-pyridinol (TCPY), a metabolite of chlorpyrifos and chlorpyrifos-methyl, and 4-nitrophenol, a metabolite of parathion and methyl parathion, were detected in almost all women; 3-phenoxybenzoic acid (3-PBA), a non-specific metabolite of several pyrethroids, and 2-isopropyl-4-methyl-6-hydroxypyrimidine (IMPY), a metabolite of diazine, were detected in 19.8% and 16.1% of the women, respectively.

The remaining four pesticide biomarkers were detected in less than 10% of the women. Women in the highest quartile of 4-nitrophenol were more than three times as likely to give birth prematurely compared with women in the lowest quartile; women in the highest quartile of 4-nitrophenol were also at greater risk of having a child born small for gestational age. Women with detectable concentrations of IMPY were at greater risk of having a child born with low birth weight compared with women with undetectable concentrations [21]. No association was observed between any of the pesticide biomarkers and dwarfism at 1 or 2 years of age.

Parvez [22] studied on glyphosate (GLY), the most widely used herbicide in the world, but the extent of exposure in pregnancy remains unknown. Its residues are found in the environment, in major crops, and in food consumed daily by pregnant women. Since GLY exposure in pregnancy may also increase the risk of fetal exposure, a birth cohort was set up to determine the frequency of exposure, potential routes of exposure, and association with fetal growth indicators and duration of pregnancy.

The mean age of the participants was 29 years, and most were Caucasian. Of the pregnant women, 93% had GLY levels above the detection limit (0.1 ng/mL). The mean urinary GLY was 3.40 ng/mL (0.5–7.20 ng/mL). Higher levels of GLY were found in women living in rural areas ( $P = 0.02$ ). None of the drinking water samples had detectable levels of GLY. No correlations were observed with fetal growth indicators such as birth weight and head circumference. Higher levels of GLY in urine, however, were significantly correlated with underweight in infants.

In a study by Quintana *et al.* [23], neonatal, placental, and umbilical cord blood parameters were observed in pregnant women living in areas with intensive pesticide use. In rural populations, the proximity of areas with intensive use of pesticides is a risk factor for exposure to xenobiotics. Newborns of mothers living in a pesticide-intensive area (PIA) demonstrated changes, especially in terms of placental and neonatal morphometric patterns, biochemical parameters of umbilical cord blood (UCB), and/or biomarkers related to oxidative stress and oxidative damage. Samples were collected from 151 healthy pregnant women living in a rural area during pesticide spraying (GRSS) and non-spraying (GRNSS) seasons as well as from women living in an urban area (control group; CG); they were then grouped according to the type of delivery (vaginal or caesarean). In the vaginal delivery group, placental weight and placental index were higher in the GR group than in the CG group ( $P = 0.01$ ), while in the cesarean delivery group, newborn weight was lower in the GRSS group than in the CG group [24].

The publications related to the exposure of pregnant women to pesticides in rural areas from 2009 to 2019 found in this study revealed the adversity caused by pesticide exposure to the health of pregnant women and their babies, such as problems in gestational weight gain, premature birth, low birth weight, presence of pesticides in the blood of both mother and newborn, presence of agricultural pesticides in the cerebral cortex of fetus, and miscarriage. For the majority of births, there is no statistically identifiable impact of pesticide exposure on birth outcomes. Mothers exposed to extreme levels of pesticides, however, have an increased likelihood of adverse outcomes.

Adequate surveillance of women's health in Brazil largely depends on the educational processes and practices of the institutions involved. Thus, it will be effective in providing adequate information and positive impacts on the society, the environment, and occupational education, with regard to the practices of pesticide use.

The strategy used in this study contributes to the dissemination of essential information to various sectors involved in the health-disease process of the population studied. The social control aimed at the evolution of surveillance actions and at a more assertive inspection in the agricultural sector. Furthermore, it assists in health promotion and the discussion to reduce the use of pesticides.

#### **4. Final considerations**

The literature consulted brings important scientific contributions on the deleterious impacts of pesticide exposure on the health of pregnant women living in rural areas. This integrative review showed that the exposure of pregnant women to pesticides in rural areas is, in fact, associated with the occurrence of a number of diseases in both mother and child.

Recent studies have shown that pesticides cause hormonal changes, deregulating the endocrine system and impairing the functioning of glands. The daily consumption of pesticides may also be associated with difficulties in pregnancy, infertility, early menopause, endometriosis, liver and kidney problems, and allergic reactions. In pregnant women, research has indicated a relationship between intrauterine exposure to pesticides and the onset of congenital malformations, abortions, and low birth weight, besides problems that may occur during childhood, such as early signs of puberty and early menarche. It is also associated with psychiatric disorders and cognitive disturbances.

Future prospective studies at individual level are needed to assess the potential impact of pesticide exposure on the health of pregnant woman and newborns.

#### **Disclosure statement**

The authors declare no conflict of interest.

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# Actual Sleep Conditions from the Last Trimester of Pregnancy to Three Months Postpartum and the Associated Minor Problems

Yumi Takagi<sup>1</sup>, Kyoko Hanahara<sup>2</sup>, Yumiko Tateoka<sup>3\*</sup>

<sup>1</sup>Graduate School of Medicine, Shiga University of Medical Science, Ōtsu, Shiga, Japan

<sup>2</sup>Department of Nursing, Faculty of Nursing, Seisen University, Shinagawa, Tokyo, Japan

<sup>3</sup>Department of Clinical Nursing, Faculty of Nursing, Shiga University of Medical Science, Ōtsu, Shiga, Japan

\*Corresponding author: Yumiko Tateoka, ytateoka@belle.shiga-med.ac.jp

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**Abstract:** *Objective:* To investigate the actual sleep conditions at four time points from the last trimester of pregnancy to 3 months postpartum, and to examine the relationship between sleep and minor problems affecting sleep. *Methods:* A cross-sectional survey on the frequency of minor problems, Pittsburgh Sleep Quality Index (PSQI), and observations in a sleep diary was carried out on women at the end of pregnancy, 2 weeks postpartum, 1 month postpartum, and 3 months postpartum. The questionnaires were distributed to 165 participants. Correlation coefficients were obtained for each item and each scale, and the associations were analyzed. *Results:* The number of valid responses was 127. In the evaluation of sleep, sleep duration was the shortest and sleep quality was the lowest in the first month after delivery based on the PSQI score. In the correlation between “psychiatric symptoms” and sleep, women with anxiety and nervousness at the end of pregnancy were associated with poorer sleep quality. At all time-points, there was a significant association between “psychiatric symptoms” and poor sleep quality. *Conclusion:* An association exists between “psychiatric symptoms” and poor sleep quality in women from the last trimester of pregnancy to 3 months postpartum.

**Keywords:** Postpartum; Sleep quality; Pregnancy

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## 1. Introduction

From early pregnancy to the last trimester of pregnancy and postpartum, there is significant change in the dynamics of hormone secretion for the maintenance of pregnancy and breast milk production <sup>[1]</sup>. Sleepiness and lethargy in women occur due to progesterone secretion from the placenta. In the last trimester of pregnancy, the inability to sleep normally due to enlarged uterus, back pain, fetal movements, and nocturia increases nocturnal arousals, thus resulting in shallow sleep <sup>[1,2]</sup>. In addition, during gestational and postpartum periods, women tend to experience minor physical and psychological problems due to physiological changes <sup>[3-5]</sup>. On average, the number of “minor problems” experienced by a woman during the entire period of pregnancy has been reported to be 27 <sup>[3]</sup>. After the second trimester, physical changes and minor problems such as an enlarged abdomen, fetal movements, back pain, and frequent urination often interrupt sleep and may prevent sleep fulfillment <sup>[6-8]</sup>. In the postpartum period, there is a sense of responsibility, tension, and anxiety arising from the accumulation of fatigue during delivery, breastfeeding,

unfamiliarity to childcare, changes in marital relationship, and the sense of being a mother [9-10]. Hormonal fluctuations before and after childbirth are significant, with symptoms of minor problems changing from time to time [8] and being continuously observed [11]. Furthermore, in view of the accompanying changes in roles and lifestyle due to childbirth, women do not get enough rest and sleep, especially from the last trimester of pregnancy to the postpartum period [12]. In recent years, the number of women with little experience in child rearing has increased due to the declining birth rate and the increase in nuclear families. Although women tend to have close counselors and supporters during pregnancy [13], the reality is that specific explanations on sleep during pregnancy are not provided by midwife in outpatient clinics, leading to health problems for expectant and nursing mothers [4,5]. Therefore, we believe that nursing professionals should emphasize on health education and improve the quality of nursing care by understanding the relationship between sleep status and physical and psychological symptoms in women from the end of pregnancy to the postpartum period.

In light of that, we conducted a survey on sleep among women from the last trimester of pregnancy to the child-rearing period and examined the relationship between sleep quality and symptoms of minor problems as a factor affecting sleep quality.

## **2. Definition of terms**

**Sleep quality:** An assessment of current sleep status using the Japanese version of Pittsburgh Sleep Quality Index, with subjective and objective indicators.

**Minor problems:** Uncomfortable symptoms that occur in the body due to hormonal fluctuations during pregnancy and in the postpartum period.

## **3. Methods**

### **3.1. Research design**

From April 2020 to June 2020, we carried out a self-administered, anonymous questionnaire survey for this cross-sectional study.

### **3.2. Study participants**

We included first-time mothers and postpartum women between the 8th month (28 weeks) of pregnancy and 3 months postpartum who consented to this study. The four time points were the last trimester of pregnancy (28 weeks or later), 2 weeks postpartum, 1 month postpartum, and 3 months postpartum. Inclusion criteria: women after 8 months of pregnancy, when various symptoms occur due to physical changes, and around 3 months postpartum, when breastfeeding and child's sleep are established (the period between these two periods is considered to be the time when women undergo significant physical changes and experience irregular sleep, which may affect their physical and mental health). Exclusion criteria: (i) history of mental illness, (ii) history of insomnia, (iii) smoked or drank alcohol before the mid-pregnancy period, and (iv) obese with a body mass index (BMI) of 25 or higher. The survey was carried out in 165 women (about 40 at each time period), taking into account those who dropped out due to incomplete data and the minimum number of subjects needed for statistical analysis is 20 at each time period [14].

### **3.3. Recruitment**

The survey was carried out in two obstetrics and gynecology clinics in prefecture A and 1 midwifery center in prefecture B. Visitors to motherhood classes, 2-week postpartum health checkups, 1-month postpartum health checkups, and 3-month postpartum breastfeeding consultations at each collaborating institution were given a written and verbal explanation of the study and asked to cooperate in the survey. The purpose, objectives, methods, and ethical considerations of the study were explained to the participants who gave

their consent, using the explanatory text of the study. The participants were asked to fill in the consent column to confirm their agreement to cooperate in the study on the written form of the unregistered self-administered questionnaire, an “L” was in the consent column when consent was given.

### 3.4. Contents of questionnaire

- (i) Demographics: age, history of pregnancy, history of childbirth, expected date of childbirth, number of weeks of pregnancy, sleeping conditions, postnatal living conditions, and number of breastfeeding sessions.
- (ii) Symptoms of minor problems (45 symptoms) <sup>[3-5,15-16]</sup>: (a) general and neuropsychiatric symptoms (easily fatigue, drowsiness, malaise, irritability, anxiety, emotional instability, decreased thinking, forgetfulness, headache, depression, tension, low motivation, weight gain, and weight loss); (b) joint and motor system symptoms (stiff shoulders, back pain, and pelvic pain); (c) urinary and genitourinary symptoms (frequent urination, incontinence, residual urine, and pubic discomfort); (d) digestive symptoms (constipation, diarrhea, increased appetite, anorexia, abdominal distention, nausea, heartburn, abdominal pain, hemorrhoids); (e) circulatory, respiratory, and vasomotor symptoms (cold extremities, edema, palpitations, shortness of breath, chest pain, dizziness, hot flashes, and sweating); (f) skin and sensory symptoms (skin dryness, itching, dullness, increased body hair, hair loss, and tinnitus). With reference to previous literature, these symptoms are common and frequent symptoms of minor problems during pregnancy and postpartum. A five-point Ritz-Cart scale was used according to the frequency of occurrence of each symptom: “1,” not at all; “2,” occasionally, about once a week; “3,” several times, every 3 to 5 days; “4,” often, every 1 to 2 days; and “5,” always. A table for each item was created.
- (iii) Pittsburgh Sleep Quality Index – Japanese version (PSQI-J) <sup>[17-19]</sup> (the PSQI scale was developed by Buysse *et al.* in 1989, and the reliability and validity of the Japanese version had been examined by Doi *et al.* <sup>[9]</sup>; PSQI has been used in many domestic and international studies as a measure of sleep quality): a total of 7 items including sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medications, and daytime sleepiness in the past month, with scores ranging from 0 to 3 points and a total score of 21 points. A higher total score indicates a subjective decrease in sleep quality, and a score of 5.5 or higher indicates the presence of a sleep disorder.
- (iv) Sleep diary: An investigation of the subject’s sleep status during the period in terms of time occupied by sleep. The subjects were asked to describe their habitual daily living conditions during that period, such as sleeping hours as a daily routine for each period, frequency of awakenings during nighttime sleep, nap times during the day, meal times, number of feedings, and time spent doing household chores.

### 3.5. Survey methodology

Three midwifery researchers with master’s degrees or above checked and revised the sentences in the survey form and the time required to complete the questionnaire. After explaining the content of the study, questionnaires were distributed to subjects in the last trimester of pregnancy, 2 weeks postpartum, 1 month postpartum, and 3 months postpartum, who consented to this study, in the waiting room of the collaborating institution for about 20 minutes per subject. The questionnaires were collected on the same day. For some who were 3 months postpartum, the questionnaires were collected by mail.

### 3.6. Statistical analysis

Statistical package software IBM SPSS 26.0 was used for data analysis, with a statistical significance level of less than 5%. Descriptive statistics were performed for each item in the questionnaire. The data were calculated, and the normality of each item was checked using Shapiro-Wilk test. For the correlation between each item and scale, Pearson’s product-rate correlation coefficient was used for normality, and Spearman’s

rank correlation coefficient was used for non-normality [20].

### 3.7. Ethical considerations

The study was conducted with the approval of the Ethical Review Committee of Shiga University of Medical Science (Approval no. R2019-287; date of approval, March 23, 2020).

## 4. Results

### 4.1. Target population

The 165 women who consented to this study were distributed as follows: 41 in the last trimester of pregnancy, 44 at 2 weeks postpartum, 43 at 1 month postpartum, and 37 at 3 months postpartum. The total number of valid responses was 127, and the valid response rates for each period were as follows: 34 (82.9%) for the last trimester, 28 (63.6%) for the first 2 weeks of postpartum, 35 (81.4%) for the first month of postpartum, and 30 (81.1%) for the third month of postpartum.

### 4.2. Demographics

The mean age of the participants at the end of pregnancy, 2 weeks postpartum, 1 month postpartum, and 3 months postpartum was  $32.6 \pm 5.0$ ,  $31.8 \pm 3.9$ ,  $32.1 \pm 4.0$ , and  $31.0 \pm 3.8$ , respectively. There were 14 (41.2%) women aged 35 or older at the last trimester of pregnancy, 8 (28.6%) at 2 weeks postpartum, 10 (28.6%) at 1 month postpartum, and 6 (20.0%) at 3 months postpartum. The proportion of first-time mothers to those who had given birth previously was about half in the last trimester and 2 weeks postpartum, while there were more first-time mothers who were in their 1 month and 3 months postpartum periods.

Among the postpartum women in the study, the highest mean total number of feedings per day was  $8.9 \pm 1.6$  in the 2-week postpartum period. The mean number of night feedings was also highest among 2-week postpartum women at  $2.8 \pm 0.7$  times. The details are shown in **Table 1**.

**Table 1.** Demographics and breastfeeding frequency by time period

		End of pregnancy n = 34		2 weeks postpartum n = 28		1 month postpartum n = 35		3 months postpartum n = 30	
	Mean $\pm$ SD	$32.6 \pm 5.0$		$31.8 \pm 3.9$		$32.1 \pm 4.0$		$31.0 \pm 3.8$	
Age		n	%	n	%	n	%	n	%
	Under 35 years old	20	58.8	20	74.4	25	74.4	24	80.0
	Over 35 years old	14	41.2	8	28.6	10	28.6	6	20.0
History of childbirth	Primipara	19	55.9	14	50.0	23	65.7	22	73.3
	Multipara	15	44.1	14	50.0	12	34.3	8	26.7
Number of feedings	Total feedings per day			$8.9 \pm 1.6$		$8.8 \pm 1.9$		$8.4 \pm 2.0$	
Number of night feedings	Mean age $\pm$ SD			$2.8 \pm 0.7$		$2.7 \pm 1.0$		$2.3 \pm 1.4$	

### 4.3. Mean sleep duration

The mean sleep duration of women at the last trimester, 2 weeks postpartum, 1 month postpartum, and 3 months postpartum was  $7.2 \pm 1.6$  hours,  $6.9 \pm 2.0$  hours,  $5.9 \pm 1.3$  hours, and  $6.4 \pm 1.5$  hours, respectively; women at 1 month postpartum had the shortest sleep duration (**Table 2**). There were eight women (23.5%) at the end of pregnancy who slept less than 6 hours, 9 (32.1%) at 2 weeks postpartum, 25 (71.4%) at 1

month postpartum, and 18 (60.0%) at 3 months postpartum. There were 10 women (28.5%) at 1 month postpartum who slept 7 to 9 hours a night and 11 (36.7%) at 3 months postpartum. 60%–70% of the women averaged less than 6 hours of sleep at 1 month and 3 months postpartum (**Table 2**).

**Table 2.** Distribution of average sleeping hours by time period

Sleep time	End of pregnancy n = 34		2 weeks postpartum n = 28		1 month postpartum n = 35		3 months postpartum n = 30	
	n	%	n	%	n	%	n	%
Mean ± SD	7.2 ± 1.6		6.9 ± 2.0		5.9 ± 1.3		6.4 ± 1.5	
Less than 6 hours	8	23.5	9	32.1	25	71.4	18	60.0
7 hours	9	26.5	10	35.7	6	17.1	6	20.0
8–9 hours	16	47.1	8	28.6	4	11.4	5	16.7
More than 10 hours	1	2.9	1	3.6	0	0	1	3.3

#### 4.4. Pittsburgh Sleep Quality Index – Japanese Version (PSQI-J) scores

The mean score of women at the end of pregnancy, 2 weeks postpartum, 1 month postpartum, and 3 months postpartum was  $5.5 \pm 3.1$ ,  $6.2 \pm 2.8$ ,  $6.6 \pm 3.2$ , and  $5.8 \pm 2.9$ , respectively (**Table 3**).

**Table 3.** PSQI-J scores by time period

PSQI-J score		End of pregnancy n = 34		2 weeks postpartum n = 28		1 month postpartum n = 35		3 months postpartum n = 30	
		n	%	n	%	n	%	n	%
Mean ± SD		5.5 ± 3.1		6.2 ± 2.8		6.6 ± 3.2		5.8 ± 2.9	
Less than 6 points	No sleep disorder	18	52.9	12	42.9	12	34.3	15	50.0
6–8 points	Mild sleep disorder	12	35.3	12	42.9	14	40.0	9	30.0
9 points or more	Severe sleep disorder	4	11.8	4	14.3	9	25.7	6	20.0

Abbreviation: PSQI-J, Pittsburgh Sleep Quality Index – Japanese version; SD, standard deviation.

#### 4.5. Relationship between sleep duration and sleep quality (PSQI) in women at each period from the last trimester to 3 months postpartum

There was a negative correlation between sleep duration and sleep quality in women at the end of pregnancy ( $r = -0.58$ ,  $P < 0.001$ ), 2 weeks postpartum ( $r = -0.67$ ,  $P < 0.001$ ), 1 month postpartum ( $r = -0.61$ ,  $P < 0.001$ ), and 3 months postpartum ( $r = -0.38$ ,  $P = 0.039$ ). It can be said that the shorter the sleep duration, the poorer the sleep quality (**Table 4**).

**Table 4.** Correlation coefficients between sleep duration and PSQI-J scores by time period

	r	P
last trimester of pregnancy	-0.58** <sup>b</sup>	< 0.001
2 weeks postpartum	-0.67** <sup>b</sup>	< 0.001
1 month postpartum	-0.61** <sup>a</sup>	< 0.001
3 months postpartum	-0.38* <sup>b</sup>	0.039

Note: <sup>a</sup>Pearson's product-moment correlation coefficient; <sup>b</sup>Spearman's rank correlation coefficient; \* $P < 0.05$ ; \*\* $P < 0.01$ .

## 4.6. Minor problems

### 4.6.1. Perceived minor problems by time period

The median and quartile range of symptom frequency were determined, and symptoms were classified by site, except for symptoms with a score of 1 or less in each time period. Symptoms with the highest values in each time period are shown in order (**Table 5**). The common symptoms of minor problems with 3 or more points among women at the four time points were easily fatigue and drowsiness; at the end of pregnancy, there were 9 common symptoms, including easily fatigue, drowsiness, malaise, back pain, frequent urination, constipation, edema, dry skin, and itchy skin; at 2 weeks postpartum, there were 4 common symptoms, including easily fatigue, drowsiness, stiff shoulders, and constipation; at 1 month postpartum, there were 6 common symptoms, including easily fatigue, drowsiness, malaise, stiff shoulders, back pain, and dry skin; at 3 months postpartum, there were 5 common symptoms, including easily fatigue, drowsiness, stiff shoulders, back pain, and dry skin.

**Table 5.** Median and quartile range for minor problems by time period

Symptoms	End of pregnancy		2 weeks postpartum		1 month postpartum		3 months postpartum	
	n = 34		n = 28		n = 35		n = 30	
	Median	Quartile range	Median	Quartile range	Median	Quartile range	Median	Quartile range
<i>General and neuropsychiatric</i>								
Easily fatigue	4.0	3.00–4.00	3.0	2.00–4.00	3.0	2.00–4.00	4.0	3.00–4.00
Drowsiness	3.5	3.00–4.00	3.0	2.00–4.00	4.0	3.00–5.00	3.0	3.00–4.25
Malaise	3.0	2.75–4.00	2.0	1.00–3.00	3.0	2.00–4.00	2.0	1.00–3.00
Irritability	2.0	1.75–3.00	2.0	1.25–3.00	2.0	1.00–3.00	2.5	1.00–2.00
Anxiety	2.0	2.00–3.00	2.0	2.00–3.00	2.0	1.00–3.00	2.0	1.00–3.00
Emotional instability	2.0	2.00–3.00	2.0	1.00–3.00	2.0	1.00–3.00	2.0	1.00–3.00
Decreased thinking	2.0	1.00–3.00	1.0	1.00–2.75	2.0	1.00–2.00	2.0	1.00–3.00
Forgetfulness	2.0	1.00–3.00	1.0	1.00–2.00	2.0	1.00–3.00	2.0	1.00–3.00
Headache	2.0	1.00–2.00	2.0	1.00–2.75	2.0	1.00–2.00	1.5	1.00–2.00
Depression	2.0	1.00–2.25	1.5	1.00–2.00	1.0	1.00–3.00	2.0	1.00–2.00
Low motivation	2.0	1.00–3.00	1.0	1.00–2.00	1.0	1.00–2.00	1.0	1.00–2.00
Tension	2.0	1.00–3.00	1.0	1.00–2.00	2.0	1.00–3.00	1.0	1.00–2.00
<i>Joint and motor</i>								
Stiff shoulders	2.0	2.00–4.00	4.0	2.00–5.00	5.0	3.00–5.00	3.5	2.00–5.00
Back pain	4.0	2.00–4.00	2.5	2.00–4.00	3.0	2.00–4.00	3.0	2.00–4.00
<i>Urinary system</i>								
Frequent urination	4.0	2.00–4.25	1.0	1.00–2.00	1.0	1.00–2.00	1.0	1.00–2.00
<i>Digestive system</i>								
Constipation	3.0	2.00–4.00	3.0	1.00–4.00	2.0	1.00–3.00	2.0	1.00–3.00
Increased appetite	2.0	1.00–4.00	2.0	1.00–3.00	2.0	1.00–3.00	2.0	1.00–4.00
<i>Cardiovascular system</i>								
Cold extremities	2.5	1.75–4.00	2.0	1.00–4.00	2.0	1.00–4.00	2.0	1.00–4.00
Edema	3.0	2.00–4.00	2.0	1.00–3.00	1.0	1.00–3.00	1.0	1.00–2.25
<i>Skin and sensory</i>								
Skin dryness	3.0	2.00–4.00	2.0	1.25–4.00	3.0	2.00–5.00	3.0	1.00–4.00
Itchy skin	3.0	2.00–4.00	1.5	1.00–3.75	2.0	1.00–3.00	2.5	1.75–3.25

#### 4.6.2. Relationship between minor problems and both sleep duration and sleep quality (PSQI)

In the last trimester of pregnancy, there was a significant association between poor sleep quality and anxiety ( $r = 0.43$ ,  $P = 0.012$ ) and tension ( $r = 0.39$ ,  $P = 0.023$ ). At 2 weeks postpartum, there was a significant association between decreased sleep quality and anxiety ( $r = 0.48$ ,  $P = 0.010$ ). At 1 month postpartum, decreased sleep was negatively associated with anxiety ( $r = -0.37$ ,  $P = 0.031$ ) and tension ( $r = -0.41$ ,  $P = 0.014$ ); there was also significant association between poor sleep quality and anxiety ( $r = 0.40$ ,  $P = 0.016$ ), tension ( $r = 0.50$ ,  $P = 0.002$ ), drowsiness ( $r = 0.46$ ,  $P = 0.006$ ), and depression ( $r = 0.41$ ,  $P = 0.014$ ). At 3 months postpartum, decreased sleep quality was significantly associated with anxiety ( $r = 0.57$ ,  $P = 0.001$ ), depression ( $r = 0.56$ ,  $P = 0.001$ ), and emotional instability ( $r = 0.55$ ,  $P = 0.002$ ). Details are shown in **Table 6**.

**Table 6.** Correlation coefficients between minor problems and sleep duration and PSQI by time period

	n		Hours of sleep		PSQI-J score	
			r	P	r	P
Last trimester of pregnancy	34	Anxiety			0.43*	0.012
		Tension			0.39*	0.023
2 weeks postpartum	28	Anxiety			0.48*	0.010
1 month postpartum	35	Anxiety	-0.37*	0.31	0.40*	0.016
		Tension	-0.41*	0.14	0.50**	0.002
		Drowsiness			0.46**	0.006
		Depression			0.41**	0.014
3 months postpartum	30	Anxiety			0.57**	0.001
		Depression			0.56**	0.001
		Emotional instability			0.55**	0.002

Note: r, Spearman's rank correlation coefficient; \* $P < 0.05$ ; \*\* $P < 0.01$ .

## 5. Discussion

### 5.1. Actual sleep condition of women from the last trimester of pregnancy to 3 months postpartum

In the present study, the average sleep duration in the last trimester of pregnancy is similar to that observed in previous studies [21,22] and to the average sleep duration during non-pregnancy as reported by the National Survey of Hours of Living [23]. Sleep is induced by sex hormones secreted by the placenta. Since the last trimester of pregnancy is a period of marked abdominal enlargement and major physical changes, about 8 hours of sleep is necessary during the gestational period [24,25]. However, it is clear that women do not get enough sleep in this period.

In our present study, the average sleep duration of women in the first month after delivery was the shortest among the other periods; this finding is similar to previous studies [26]. We believe that unfamiliarity to childcare, breastfeeding, irregular sleep-wake rhythm of the newborn, and a sense of responsibility as a mother [27] may have contributed to the decrease in sleep duration during the first month after delivery. A decrease in sleep duration during the first month postpartum affects the mother's physical and mental health, causing maternal fatigue, poor concentration, and lethargy. For a woman to maintain her health without excessive daytime sleepiness and without disrupting her life, 7–9 hours of sleep are needed [21,28]. In the present study, 60% of women in the last trimester of pregnancy and the first 2 weeks of postpartum slept 7–9 hours; 71.4% of women in the first month after delivery and 60.0% in the third month after delivery slept 6 hours or less. These results showed that many women in the first to third month after delivery sleep extremely little, with little or no decrease in the number of nighttime feedings or feedings per day,

suggesting that sleep duration may be inadequate over several months. Persistent sleep deprivation has been linked to postpartum depression [29]. Lifestyle guidance on sleep should be provided from the time of pregnancy to promote the mother's physical and mental stability as well as mother-child relationship; in addition, their sleep status should be inquired during examinations; after childbirth, it is necessary to provide lifestyle and sleep guidance that takes into account of life with the child.

## **5.2. PSQI scores of women from the last trimester of pregnancy to 3 months postpartum**

In terms of women's sleep quality from the last trimester of pregnancy to 3 months postpartum based on PSQI, we found that the mean PSQI score from the last trimester of pregnancy to the third month postpartum was 5.5 or higher. Among the four time points, the highest score was observed in women at 1 month postpartum, indicating that their sleep quality was poor. In addition, we also found that women in the first month of postpartum had the shortest sleep duration, thus further indicating poor sleep quality.

The classification of "sleep disturbances" by PSQI indicated that about half of the mothers in the study had sleep disturbances. Mindell *et al.* [7] found that 83.5% of women had sleep disturbances at 8 months of gestation [7]. In addition, Rinko *et al.* [29] stated that the frequency of sleep disturbances is high in women by about 12 weeks of delivery. Sleep disturbance is a condition in which there are some problems with sleep that last for more than one month. There are about 100 sleep-related illnesses and a variety of sleep disorders that interfere with daily life due to insomnia or daytime sleepiness [30]. Tomfohr *et al.* [31] reported that in a group with high PSQI scores during pregnancy, the patients were treated for depression during pregnancy and subsequently experienced postpartum depression. The major changes in physical and mental health during pregnancy and in the postpartum period tend to disrupt sleep habits, which can easily lead to physical and mental alterations [12]. It is necessary to understand the daily life of women in pregnancy and after delivery as well as provide health guidance based on the individual's background beginning from the pregnancy period.

## **5.3. Sleep and minor problems in women from the last trimester of pregnancy to three months postpartum**

In our study, no association was found between sleep and "physical symptoms" at all time points, but in terms of "psychiatric symptoms," women with anxiety and tension in the last trimester of pregnancy were found to be associated with poorer sleep quality. Among women at 1 month postpartum, anxiety and tension were associated with decreased sleep duration, and drowsiness, tension, anxiety, and depression were associated with poor sleep quality. In women at the 3 postpartum time points, "psychiatric symptoms" were associated with poor sleep quality.

Hormone secretion, which is usually highest in the last trimester to maintain pregnancy, declines rapidly after delivery. In the postpartum period, prolactin and oxytocin are secreted in pulses during breastfeeding. This rapid change in hormonal dynamics can destabilize mental health. It has been suggested that the "physical symptoms" and "psychiatric symptoms" of minor problems in pregnancy, childbirth, and postpartum may be caused by hormones [32] and the "psychiatric symptoms" of minor problems are exacerbated by decreased sleep time and poor sleep quality during pregnancy and in the postpartum period. The occurrence of daytime sleepiness and "psychiatric symptoms" resembled symptoms of sleep disturbances. Women's perception of symptoms is an indicator of sleep deprivation. In light of that, it is necessary to solve this problem through health education, so that sleep quality-improving self-care behaviors can be habituated from the period of pregnancy.

## **6. Limitations of this study and prospects**

In this study, the results of minor problems may not have sufficient validity in view of the use of a self-

made scale. Another limitation of this study is that sleep duration was self-reported and thus cannot be deemed as objective data. In the future, a longitudinal study should be conducted to ensure reliability, and comparisons should be made at each time period using continuous data to confirm the relevance of data on an individual basis.

## 7. Conclusions

- (i) The average sleep duration at the end of pregnancy is similar to that of non-pregnant women.
- (ii) Women who are anxious and tense during the last trimester of pregnancy are associated with poorer sleep quality.
- (iii) 60%–70% of women in the first and third month after delivery sleep less than 6 hours on average.
- (iv) Postpartum “psychiatric symptoms” of minor problems, such as anxiety, tension, and depression, are associated with poor sleep quality.
- (v) Sleep is not associated with “physical symptoms” of minor problems at all time points.

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## Disclosure statement

The authors declare no conflict of interest.

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# High Uterosacral Ligament Suspension with Nonabsorbable Suture in Apical Prolapse: A 24-Month Follow-Up

Rodolfo E. Lopez-Orellana\*, Francisco J. Kaplan-Delmar, Andres I. Yuivar-Santana, Tiare A. Hevia-Grez

Obstetrics and Gynecology Service, Pelvic Floor Unit, Quilpué Hospital, Viña del Mar, Chile

\**Corresponding author:* Rodolfo E. López-Orellana, drlopezorellana@gmail.com

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**Abstract:** *Background:* Pelvic organ prolapse (POP) is a common pathology affecting up to 60% of women. Transvaginal high uterosacral ligament suspension (HUSLS) is an alternative treatment for apical prolapse. HUSLS has short operative and recovery time, as well as low complication rate. *Objective:* To evaluate the objective and subjective success rates in patients with apical prolapse who underwent HUSLS at Quilpué Hospital over a 24-month follow-up. *Materials:* A retrospective, observational, descriptive study was carried out, and all symptomatic patients with apical prolapse  $\geq$  stage 2 POP-Q classification who underwent HUSLS between September 2014 and October 2019 were included in the study. Data were obtained from the database of the Urogynecology Unit of Quilpué Hospital, after approval by the ethics committee. Objective success was defined as C-point at 1 cm above the hymen, while subjective success was defined as “better” or “much better” in the Patient Global Impression of Improvement (PGI-I) scale and/or a visual analog scale (VAS) greater than 80% at 24 months of follow-up. *Results:* Of the 46 patients included in the study, the objective success rate was 84%, while the subjective success rate was 70%. *Conclusion:* Transvaginal HUSLS with permanent sutures is an excellent alternative treatment for apical prolapse, with a success rate similar to the gold standard at 24 months follow-up.

**Keywords:** Apical prolapse; High uterosacral ligament suspension

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## 1. Introduction

Pelvic organ prolapse (POP) is a common pathology that affects 40%–60% of women after one or more vaginal deliveries <sup>[1]</sup>. Before the age of 80, between 11% and 19% of women will undergo surgery to correct POP or urinary incontinence (UI) <sup>[2,3]</sup>, thus demonstrating the epidemiological importance of this pathology. It is estimated that the demand for POP treatment in the next 30 years will increase by about 45% <sup>[4,5]</sup>, given the sustained aging of the population. POP can affect the anterior and posterior vaginal wall as well as the uterus or vaginal vault in hysterectomized patients. The descent of the uterus or vaginal vault through the vagina is defined as an apical defect <sup>[6]</sup>.

Both genetic and environmental factors contribute to the complex and multifactorial etiology of POP. Genetic factors can alter the resistance and elasticity of connective tissue, especially collagen, and the most common environmental factors known include pregnancy, vaginal delivery, forceps, age, birth weight, pelvic surgeries that affect the vascular and/or nerve supply, and diseases that chronically increase intraabdominal pressure <sup>[7,8]</sup>.

The apical support of pelvic organs is conditioned by the integrity of the uterosacral-cardinal ligament complex and the vesicovaginal fascia, the rectovaginal fascia, and levator ani muscle (MEA) [9]. At present, surgery has been shown to be superior to conservative treatments for apical POP, and the gold standard, as of now, is uterine and/or vaginal sacropexy [1]. The native vaginal approach has demonstrated objective (anatomical) and subjective outcomes similar to those of the gold standard, with shorter operative and recovery times as well as lower complication rates and complexity [11].

At Quilpué Hospital, most apical prolapse are resolved vaginally by means of high uterosacral ligament suspension (HUSLS).

The aim of this study was to evaluate the anatomical and subjective success rates in patients with apical defect who underwent transvaginal HUSLS with nonabsorbable sutures over a follow-up period of 24 months. The secondary objective was to evaluate intraoperative and postoperative complications, anatomical success of the anterior and posterior compartment, operative time, and hospitalization time.

## 2. Materials and methods

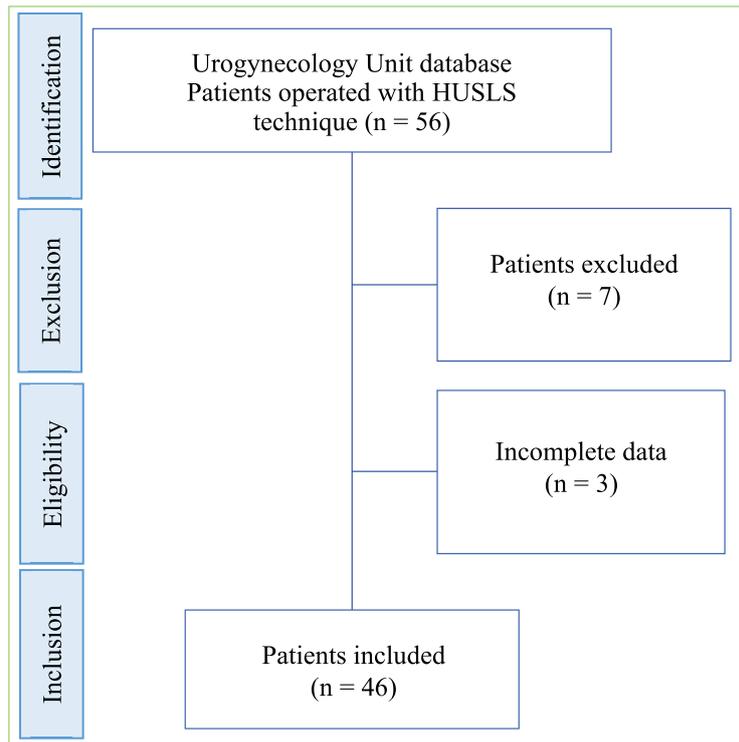
A retrospective, observational, descriptive study was carried out between September 2014 and October 2019 at Quilpué Hospital, Chile. All patients older than 18 years who underwent HUSLS for symptomatic apical prolapse  $\geq$  stage 2 POP-Q classification were selected. Patients with previous POP surgery were excluded. The study design and protocol were approved by the ethics committee of the University of Valparaiso, Chile. Information was obtained from the database of the Urogynecology Unit and the operative protocol of the Surgical Unit of Quilpué Hospital.

Objective (anatomical) success was defined based on the location of the apical component (POP-Q point C 1 cm above the hymen) and the anterior and/or posterior vaginal wall (POP-Q point Aa, Ba, Ap, or Bp above 0). Subjective success was defined as “better” or “much better” in Patient Global Impression of Improvement (PGI-I) scale and/or a visual analogue scale (VAS) greater than 80% for POP symptoms [13]. Transvaginal HUSLS was performed based on Shull’s technique, identifying both uterosacral ligaments at the level of the ischial spines, mounting one or two polypropylene sutures on each of them, and then anchoring them to the vesicovaginal and rectovaginal fasciae at the level of the vaginal vault, after a classic vaginal hysterectomy. In required cases, vaginoplasty of the anterior or posterior wall was performed, plicating the respective fascia with polydioxanone sutures and perineoplasty on a case-by-case basis as well as TVT (tension-free vaginal tape) or TOT (transvaginal obturator tape) in patients with stress urinary incontinence (SUI). Closure of the vaginal vault was performed with polyglycolic acid sutures, leaving the polypropylene sutures of the HUSLS completely covered. In all cases, ureteral patency was assessed with intraoperative cystoscopy and intravenous Indigo Carmine®. One or two vaginal gauzes were left in place for 24 hours. Postoperative controls were performed at 3, 6, 12, and 24 months.

Statistical analysis was performed with Stata, a statistical software for data science. The baseline demographic and clinical variables were expressed in mean and standard deviation, and the statistical analysis was descriptive. Kaplan-Meier curves were used to analyze the anatomical and subjective success rates over time.

## 3. Results

Fifty-six patients underwent surgery, among which seven (10%) did not present themselves for postoperative follow-up, and three (4%) did not have complete data, so only 46 patients were included in the study (**Figure 1**). The average age was 66 years old, average parity was 3.5, and average body mass index (BMI) was 28.4 kg/m<sup>2</sup> (**Table 1**).



**Figure 1.** Patient selection process

**Table 1.** Baseline demographic variables

Demographic variables	Average (mean $\pm$ standard deviation, SD)
Age	66.39 $\pm$ 8.02
Number of births	3.5 $\pm$ 1.81
Body mass index	28.4 $\pm$ 4.42

As shown in **Table 2**, the most frequent comorbidity was arterial hypertension (AHT), with a proportion of 43.5%; with regard to the affected compartment, all had apical defect, 54% had anterior compartment defect, and 11% had posterior compartment defect. The same figure shows that 82.6% of the patients had  $\geq$  stage 3 prolapse.

**Table 2.** Baseline clinical variables

Baseline clinical characteristics	n (%)
Previous POP surgeries	2 (4.35%)
POP-Q $\geq$ 2	46 (100%)
POP-Q $\geq$ 3	38 (82.6%)
Arterial hypertension	20 (43.5%)
Diabetes mellitus	5 (10.9%)
SUI	25 (54%)
Affected compartment	
Apical	46 (100%)
Anterior	25 (54%)
Posterior	5 (11%)

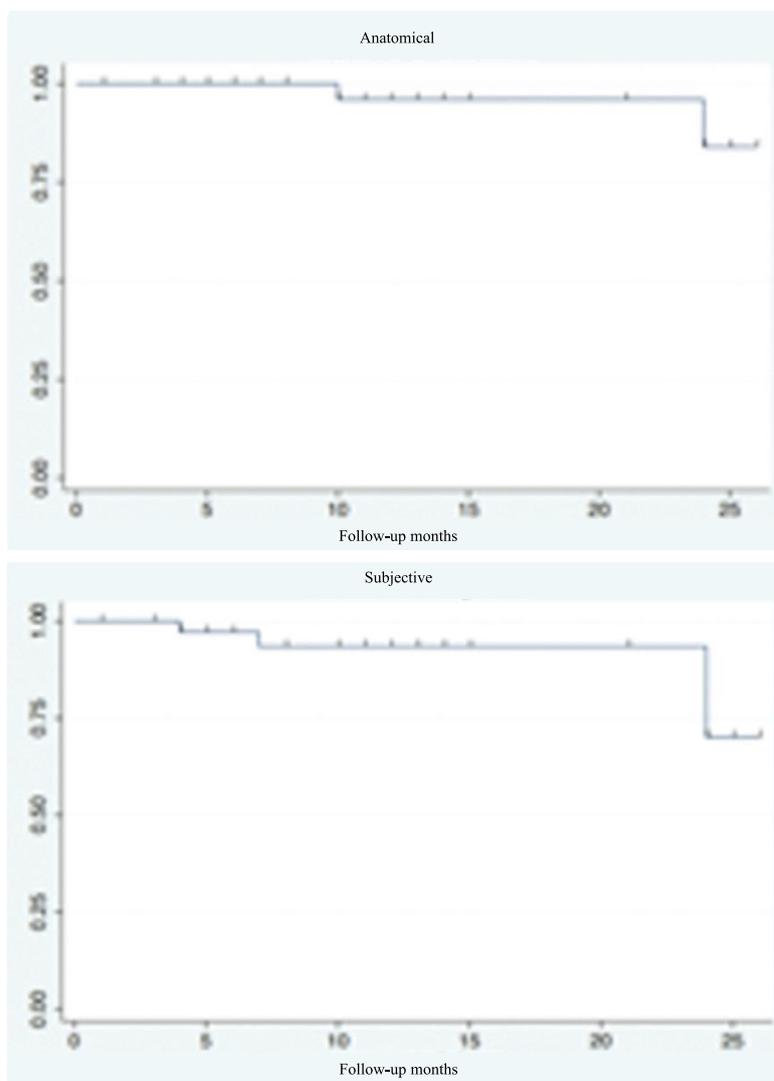
Abbreviations: POP: pelvic organ prolapse; SUI, stress urinary incontinence.

All patients underwent intraoperative cystoscopy with Indigo Carmine® to evaluate ureteral patency, 67% underwent salpingectomy, 54% underwent surgery for SUI, and 67% underwent vaginoplasty (anterior, posterior, and/or perineoplasty), with anterior vaginoplasty being the most frequent. The average operative time and hospitalization time were 103 minutes and 2.2 days, respectively (**Table 3**).

**Table 3.** Average operative time and hospitalization time

Hospitalization time (days)	2.2 ± 0.59
Operative time (minutes)	103 ± 19
Intraoperative complications	2.1%
Suture exposure	15%
Conversion to abdominal surgery	0%

The objective and subjective success rates in patients with apical defect were 96% (95% confidence interval [CI]: 0.74–0.79) and 93% (95% CI: 0.75–0.98) at 12 months follow-up, respectively, and 84% (95% CI: 0.43–0.96) and 70% (95% CI: 0.32–0.89) at 24 months follow-up, respectively. Both are expressed in Kaplan-Meier survival curves (**Figure 2**).



**Figure 2.** Kaplan-Meier survival curves of anatomical and subjective success rates in patients

The follow-up at 6, 12, and 24 months is detailed in **Table 4**.

**Table 4.** Follow-up at 6, 12, and 24 months

Follow-up	6 months	12 months	24 months
n (%)	28 (61%)	23 (50%)	12 (26%)

Seven patients (15%) had anterior compartment failure, of which 2 were at six months, 2 at 12 months, and 3 at 24 months postoperative follow-up. Two patients (4%) had posterior compartment failure, with only one requiring corrective surgery.

As shown in **Table 3**, only 1 patient (2.1%) had intraoperative complications. The complication was the failure to prove right ureteral patency with Indigo Carmine®. In 7 patients (15%), there was evidence of exposure of Prolene® suture in the vaginal vault during the postoperative follow-up period.

#### 4. Discussion

Currently there are several surgical approaches to apical prolapse, of which the gold standard is uterine and/or vaginal sacropexy. However, the vaginal approach has been proven to be an excellent alternative. Our results are similar to those of Nygaard in the 2013 CARE study and those of Rondini in 2015. We believe that the use of nonabsorbable sutures and the surgical technique itself contributes to the rationale. It is important to emphasize that 82.6% of patients in our study presented with advanced POP, ( $\geq$  stage 3) and despite this, we achieved good anatomical and subjective results.

Of the cases who had recurrent apical prolapse, one was resolved surgically by bilateral sacrospinous ligament fixation, while another by colpocleisis, since the patient is not sexually active.

We believe that the low percentage of intraoperative and postoperative complications was due to the small sample size and the fact that the surgeries were performed by a single surgeon with strict and formal training in urogynecology. Only one patient had intraoperative complication; right ureteral patency could not be proven with Indigo Carmine® or by means of catheterization even after 40 min of cystoscopic observation, so the right suture was removed; subsequently, we verified that the patient had chronic renal disease with a significant decrease in renal function, thus explaining the delay in Indigo Carmine® depuration; however, despite the fact that only the left suture was maintained, the patient had no treatment failures during the 24 months of follow-up.

Only 7 (15%) patients had Prolene® suture exposure in the vaginal vault at 24 months of follow-up, and most of them were asymptomatic. Only 5 patients presented with dyspareunia. All exposures were resolved by cutting the suture in the outpatient clinic; this completely eliminated the symptoms.

Our study showed that HUSLS has shorter operative time than colposacropexy, despite the fact that several surgeries were associated with it, including -plasty of other compartments, treatment for SUI, and salpingectomy, which may further lengthen the operative time<sup>[14,15]</sup>. The decision to perform salpingectomy is related to the prevention of ovarian epithelial carcinoma<sup>[16]</sup>.

The current gold standard for apical prolapse is still colposacropexy, which has been shown to have higher anatomical success rates than other techniques; although it has similar subjective success rates to HUSLS, it has significantly longer operative time<sup>[11,15]</sup>, more severe complications<sup>[17]</sup>, longer hospitalization time<sup>[11]</sup>, longer learning curve, and higher costs<sup>[14,18]</sup> compared to HUSLS. This leads us to believe that HUSLS is an excellent alternative treatment for apical prolapse, given that the patient's perception of improvement (subjective) is more important than that of the physician (objective).

The strengths of this study are as follows: all surgeries were performed by the same surgeon with a standardized technique; all patients were thoroughly evaluated before and after surgery; and all data were

tabulated in the patient management file under the Urogynecology Unit of Quilpué Hospital.

Among the limitations of the study, we would like to emphasize the retrospective nature of the study, the size of the sample, and the proportion of patients who remained under follow-up up to 24 months after surgery, although we believe that if there had been more symptomatic recurrences, a greater proportion of patients would have continued to follow-up. Another potential limitation is that the postoperative evaluation was done by the same surgeon who performed the surgery, which may lead to bias. With respect to subjective success, the drop from 93% to 70% could be due to the sum of objective failures (POP-Q > 0) that lead to symptoms such as vulvar lumpiness and those caused by concomitant pathologies such as polyuria due to decompensated diabetes, urine incontinence, and/or lack of estrogen since it may be difficult for some patients to differentiate the symptoms of POP from those of other anatomically close pathologies. It should be noted that the majority of patients who underwent surgery had more than one pathology.

## 5. Conclusion

HUSLS with nonabsorbable sutures is an excellent alternative for treating apical prolapse vaginally, with a high rate of anatomical and subjective success, improvement in the quality of life of patients, and a low rate of complications (less than 5%), in addition to shorter operative time and hospital stay. More statistically studies are required to confirm these findings.

## Disclosure statement

The authors declare no conflict of interest.

## Data availability

The supplementary material of this work is available at <https://doi.org/10.24875/RECHOG.22000005>. The content of the supplementary material is the sole responsibility of the authors.

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# Cushing's Disease in Pregnancy and Cabergoline Use: Obstetric and Neonatal Outcomes

Natacha B. Murillo<sup>1</sup>, Constanza Ramacciotti<sup>1</sup>, Carolina Fux-Otta<sup>2,3</sup>, Laura A. Cecenarro<sup>1\*</sup>

<sup>1</sup>Department of Endocrinology, Hospital Privado Universitario de Córdoba, Córdoba, Argentina

<sup>2</sup>Department of Endocrinology and Diabetes, National Maternity University Hospital, Faculty of Medical Sciences, National University of Córdoba, Córdoba, Argentina

<sup>3</sup>Hospital Translational Knowledge Unit (UCTH), National Maternity University Hospital, Faculty of Medical Sciences, National University of Córdoba, Córdoba, Argentina

\*Corresponding author: Laura A. Cecenarro, laurycece@hotmail.com

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**Abstract:** Pregnancy in patients with Cushing's disease (CD) is rare and is associated with significant maternal and fetal complications. We report a case of CD who achieved uncomplicated pregnancy and delivery after treatment with low-dose cabergoline. A 29-year-old woman was diagnosed with CD (adrenocorticotrophic hormone-secreting macrotumor that causes displacement of the optic chiasm, infiltrates the right cavernous sinus, and engulfs the internal carotid artery) and underwent transsphenoidal surgery with incomplete tumor resection. After a year of clinical stability, her symptoms recurred, and cabergoline was initiated. During the treatment, the patient conceived, and the medication was suspended. In the first trimester, clinical and biochemical parameters indicate active CD, so cabergoline was reinstated at a low dose for the rest of the pregnancy. With the dopaminergic agonist, her clinical and laboratory parameters normalized, and the patient gave birth to a healthy girl at 38 weeks, within normal percentiles and without complications. Pregnancy in patients diagnosed with CD is a rare event, and the consequences of maternal-fetal exposure to hypercortisolism can be severe. Our experience with the use of cabergoline at low doses in a pregnant woman with CD contributes favorable data to the scarce existing literature reports, adding evidence on the safety profile of the drug in this population.

**Keywords:** Cabergoline; Cushing's syndrome; Pregnancy

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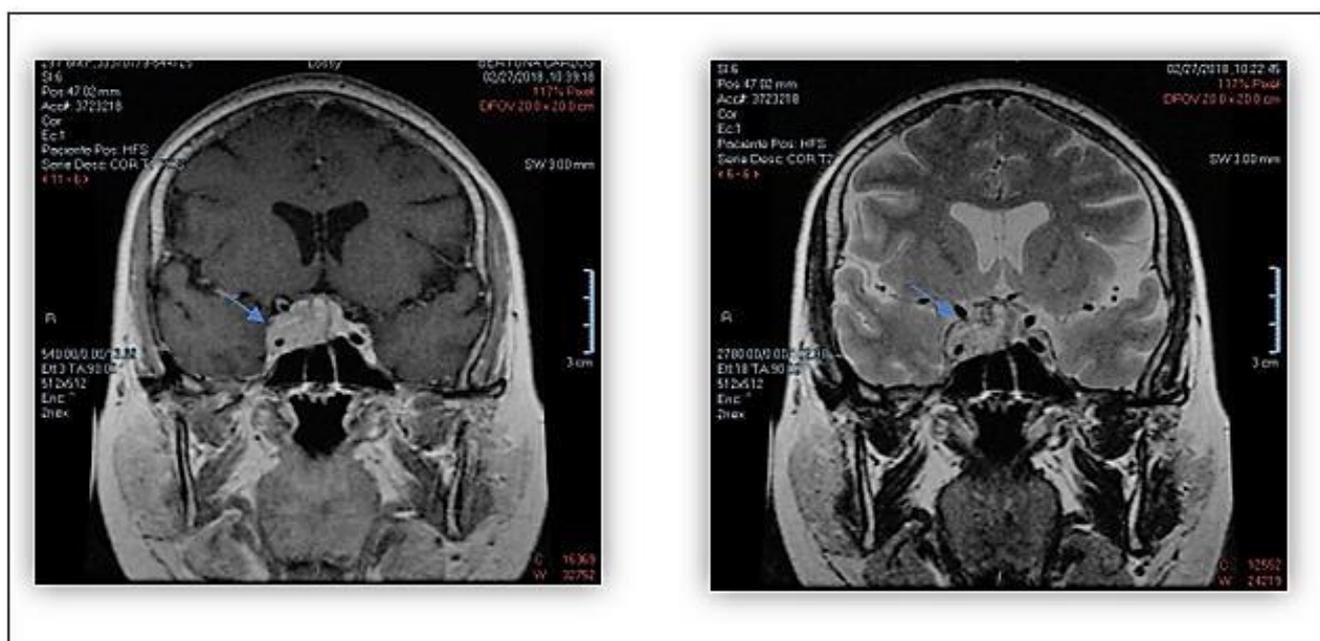
## 1. Introduction

Pregnancy in patients with Cushing's disease (CD) is extremely rare and is associated with significant maternal-fetal complications <sup>[1]</sup>. In such cases, it is important to control the cortisol level during gestation, either with surgical or pharmacological treatment, for favorable obstetric-neonatal outcomes <sup>[2]</sup>. We report a case of CD who achieved uncomplicated pregnancy and delivery upon treatment with low-dose cabergoline (CAB) for persistent hypercortisolism.

## 2. Case

A 29-year-old woman with history of hypothyroidism, arterial hypertension, menarche at age 18, and two uncomplicated pregnancies, sought medical attention in January 2018 for weight gain of 12 kg over a period of 1 year. On further history, we found that the patient also had oligomenorrhea, frequent headaches, and

emotional lability. On physical examination, her weight was 78 kg, height was 158 cm, body mass index (BMI) was 31.24 kg/m<sup>2</sup>, and blood pressure (BP) was 110/75 mmHg; she had cushingoid facies, supraclavicular fat pad, globular abdomen with vinous-red striae, and dorsal hump. With suspicion of Cushing's syndrome (CS), investigations were done: morning plasma cortisol (Co AM) was 25.51 µg/dL [normal value (NV) < 22.5 µg/dL]; adrenocorticotropic hormone (ACTH) was 129 pg/mL (NV < 46 pg/mL); nocturnal salivary cortisol was 0.8 µg/dL (NV < 0.27 µg/dL); urinary free cortisol (UFC) was 290 µg/24 h (NV 20.9–292 µg/24 h); plasma cortisol level in dexamethasone suppression test was 11.9 µg/dL (NV < 1.8 µg/dL); and thyrotrophin (TSH) was 0.22 µUI/mL (NV 0.55–4.78 µUI/mL); other pituitary panel, glucose, electrolytes, and liver function were normal. Magnetic resonance imaging (MRI) of the pituitary reported a lesion of 30 mm in the greatest cephalo-caudal diameter in contact with and displacement of the optic chiasm, infiltrating the right cavernous sinus and encompassing the internal carotid artery (**Figure 1**).



**Figure 1.** Nuclear magnetic resonance images of the sellar region. Coronal T1 (left) and T2 (right), showing pituitary microlesion, involving the right cavernous sinus and optic chiasm (blue arrows).

Given the diagnosis of ACTH-secreting pituitary macrotumor, ketoconazole was indicated, and she was referred to neurosurgery for surgical treatment. Transphenoidal surgery was performed in May 2018. The patient had a postoperative course without complications. On the fourth day after surgery, the AM cortisol was 2.81 µg/dL, without interference from exogenous glucocorticoids, so we decided to start her on hydrocortisone. The pathological findings were as follows: pituitary adenoma with ACTH expression and Ki-67 index of 10%, confirming the diagnosis of CD.

In the third month after surgery, MRI reported the following: decrease in size of the lesion located in sellar and suprasellar topography, leaving a small remnant at the level of the right cavernous sinus. The control computerized campimetry was normal, and the laboratory investigation of hormonal level was within the reference limits. The corticoid was gradually suspended. One year after surgery, the patient lost 15 kg, and her menstrual cycles became regular. However, her UFC and ACTH values increased progressively, so she was started on CAB 0.5 mg weekly (**Table 1**).

**Table 1.** Changes in biochemical parameters during follow-up

Timeline	AM cortisol ( $\mu\text{g/dL}$ ) (NV 5–22 $\mu\text{g/dL}$ )	Urinary free cortisol ( $\mu\text{g/24 h}$ ) (NV 20.9– 292 $\mu\text{g/24 h}$ )	Nocturnal salivary cortisol ( $\mu\text{g/dL}$ ) (NV < 0.27 $\mu\text{g/dL}$ )	ACTH ( $\text{pg/ml}$ ) (NV < 46 $\text{pg/ml}$ )
May 2018	7.21			35
June 2018		13.5	0.11	
December 2018	11.48	158	0.14	43.4
March 2019	1.54			
	(post-dexamethasone 1 mg)			
August 2019		478	0.13	
January 2020	11.94	155		69

She was prescribed with CAB intermittently for approximately 4 months but due to the diagnosis of pregnancy (despite insistence on the use of contraceptive methods), it was discontinued. During the first trimester, her UFC values increased (more than 2 times the NV), and oral glucose tolerance test (OGTT) was diagnostic for gestational diabetes. For this reason, CAB 0.5 mg/week was reintroduced during the second trimester, with hygienic-dietary measures and strict monitoring of blood glucose levels. The patient remained normotensive throughout the pregnancy, with improvement in UFC and OGTT without the need for insulin. Hence, the dose of the dopaminergic agonist (DA) was reduced by half. At 38 weeks of gestation, a baby girl was delivered by cesarean section with an APGAR score of 9/10. She was 3140 g (50th percentile), 47 cm in length (50th percentile), and had a head circumference of 35 cm (50th percentile). During puerperium, there were no complications, and her diabetes reclassification was normal. After delivery, CAB was suspended, and breastfeeding was maintained for 9 months. Subsequent controls showed elevated ACTH levels (72  $\text{pg/mL}$ ) and tumor remnant by MRI. Clinically, the patient had weight gain, the appearance of a hump, stretch marks, and headaches. Hence, radiosurgery was performed, with administration of a single dose of 22 Gy (Trilogy Linear Accelerator). Good clinical and biochemical results were observed 6 months after the intervention.

### 3. Discussion

CD is a rare condition with an incidence of 1.2 to 2.4 million per year in European studies and 6.2–7.6 million per year in the United States [3]. CD is characterized by a state of hypercortisolism caused by ACTH secretion from a pituitary neuroendocrine tumor. In women of childbearing age, hypercortisolism is associated with alterations of the reproductive axis, hypogonadism, and infertility, and if pregnancy occurs, there is greater maternal-fetal morbidity and mortality [2].

Caimari *et al.* [4] reviewed 263 pregnancies in patients with CS and found higher rates of gestational diabetes and pre-eclampsia in the group of patients with active CD versus the group with remission. In offspring, the following complications may occur: premature birth, intrauterine growth retardation, stillbirth, and fetal hypoadrenalism [5]. For these reasons, the management of CD during gestation should be early and comprehensive. However, diagnosis is a great challenge since the signs and symptoms of pregnancy overlap with those of the disease (fatigue, weight gain, hirsutism, emotional instability, stretch marks, and facial plethora) [6].

In pregnancy, physiologically, the hypothalamic-pituitary-adrenal axes and the renin-angiotensin-aldosterone system are activated, with a 2- to 3-fold increase in plasma cortisol levels as a result of elevated corticosteroid-binding globulin [7]. Nevertheless, the circadian rhythm of cortisol is maintained, which is why measurement of nocturnal salivary cortisol is recommended in most diagnostic protocols [8]. During

the second and third trimester, UFC also increases; therefore, UFC should not be considered a reliable marker after the first trimester, unless the increase is 2 to 3 times with respect to the NV [9].

In the case of our patient, we consider that pregnancy was achieved due to CAB treatment previously administered for persistent hypercortisolism secondary to post-surgical tumor remnant.

It is known that DAs restore the gonadal axis and fertility and their use in pregnant patients with prolactinomas has not demonstrated significantly greater adverse outcomes than those in the control population [10,11]. However, the experience with the use of CAB in CD during pregnancy is very limited, and for this reason, it was decided to discontinue AD and strictly control the clinical and biochemical parameters of the patient. The elevated UFC values in the first trimester and the diagnostic OGTT for gestational diabetes led us to resume treatment with low-dose CAB (0.5 mg/week), along with a dietary and physical activity plan adjusted to pregnancy. With these efforts, the clinical and biochemical parameters normalized, and thus the dose of AD was reduced by half. At 38 weeks, a cesarean section was performed, and a baby girl was delivered without complications.

Reports in literature on CAB treatment for CD during pregnancy are scarce compared to those of prolactinomas. Pivonello *et al.* [12] demonstrated the expression of dopaminergic receptors in corticotroph adenomas, thus hypothesizing that DAs induce the suppression of ACTH secretion and inhibition of cell growth. Although the treatment of choice is surgery, there is a percentage of persistence or recurrence of the disease; thus, medical and/or radiotherapeutic treatment should be considered as the second option. In our case, post-surgical remission could not be affirmed (despite the post-surgical cortisol level being lower than 3 µg/dL and the need for hydrocortisone replacement therapy) due to the tumor remnant in the cavernous sinus. Likewise, the history of macrotumor with Ki67 expression greater than 3% orients us to more aggressive lesions with worse prognosis [8]. In line with our experience, Nakhleh *et al.* [13] reported a case of CD in which the patient underwent non-curative pituitary surgery and conceived spontaneously four months after starting CAB, which was maintained at low doses throughout gestation; favorable outcomes were observed without evident complications [13]. Another similar case, reported by Sek *et al.* [14], describes a patient with CD treated with surgery and radiosurgery without achieving remission, and due to gestational desire, CAB was initiated, achieving spontaneous conception and pregnancy without complications [14].

Although there are other pharmacological options, not all available drugs have been shown to be safe, and some may even cause adverse events in mother and fetus. This is the reason they are contraindicated during pregnancy (**Table 2**) [5,15].

**Table 2.** Drugs used in the treatment of Cushing’s disease and their effects on pregnancy

Drug	Mechanism of action	Effect on pregnancy	References
Ketoconazole	Steroidogenesis inhibitor	Male fetus feminization	[15]
Mitotane	Adrenostatic and adrenolytic	Teratogenic	[15]
Metyrapone	Steroidogenesis inhibitor	Hypertension, preeclampsia, and preterm labor	[5]
Mifepristone	Glucocorticoid receptor antagonist	Abortifacient	[15]
Pasireotide	Somatostatin analog	Toxicity in animal reproduction studies	[15]

#### 4. Conclusions

Pregnancy in patients with CD is a rare event. The consequences of maternal-fetal exposure to hypercortisolism can be severe. Our experience with the use of low-dose CAB in a pregnant woman with CD contributes favorable data to the scarce existing literature reports, adding evidence on the safety profile of the drug in this population.

## Disclosure statement

The authors declare no conflict of interest.

## Author contributions

All authors were involved in conceptualization, data curation, and manuscript preparation, taking public responsibility for its content and approving its final version.

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# Comparison of the Effects of Individualized Postpartum Pelvic Floor Rehabilitation at Different Time Points in the Early Postpartum Period

Ting Dong\*

Department of Obstetrics, Affiliated Hospital of Jiangsu University, Zhenjiang 212000, Jiangsu Province, China

\*Corresponding author: Ting Dong, d20220217\_t@sina.com

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**Abstract:** *Objective:* To determine the clinical value of applying individualized postpartum pelvic floor rehabilitation at different time points in the early postpartum period. *Methods:* 184 patients admitted to the Affiliated Hospital of Jiangsu University from February 2021 to December 2022 were included in the study. Upon admission, they were divided into two groups, a conventional group (n = 46) and an intervention group (n = 138), by the random number table method. The patients in the conventional group underwent postpartum routine rehabilitation, while those in the intervention group underwent individualized postpartum pelvic floor rehabilitation. The patients in the intervention group were further divided into intervention group 1 (6–8 weeks), intervention group 2 (8–10 weeks), and intervention group 3 (10–13 weeks) according to the time of care. The rehabilitation effects were compared between the groups. *Results:* The pelvic floor muscle function of the patients in the intervention group was more ideal compared with those in the conventional group, and the incidence of adverse reactions was lower among patients in the intervention group; the comparison of the above indicators was statistically significant ( $P < 0.05$ ); however, there was no significant difference in the relevant indicators among intervention group 1, group 2, and group 3 ( $P > 0.05$ ). *Conclusion:* Although our study showed no significant difference in the effects of individualized postpartum pelvic floor rehabilitation at different time points in the early postpartum period, individualized postpartum pelvic floor rehabilitation in the early postpartum period has definite clinical value, as it improves pelvic floor muscle function and reduces the incidence of adverse reactions.

**Keywords:** Different time points; Individualized postpartum pelvic floor rehabilitation; Clinical value

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## 1. Introduction

In China, the proportion of second child and mothers of advanced age has shown an upward trend in recent years. Pregnancy and childbirth are events unique to women. Women are likely to develop pelvic floor dysfunction during childbirth, resulting in a series of adverse events, such as stress urinary incontinence, sexual dysfunction, and pelvic organ prolapse. Therefore, we must pay close attention to the recovery of pelvic floor function in postpartum women. Generally, exercises related to pelvic floor muscle function are performed to promote the recovery of pelvic floor muscles. Postpartum pelvic floor muscle functional rehabilitation is a form rehabilitation training. It is a non-invasive and painless intervention program that plays a significant role in helping mothers rehabilitate in the postpartum period. Based on this, the medical

records of 184 patients admitted to our hospital in the past two years were analyzed retrospectively in this study, and the clinical value of postpartum pelvic floor rehabilitation is reported in this paper.

## **2. Materials and methods**

### **2.1. General patient information**

A total of 184 patients admitted to our hospital from February 2021 to December 2022 were included in the study. Upon admission, they were divided into four groups by the random number table method: conventional group ( $n = 46$ ); intervention group 1, intervention group 2, and intervention group 3 ( $n = 46$ ). The patients in the conventional group were 22–37 years old, with an average age of  $29.56 \pm 3.57$ ; the patients in intervention group 1 were 23–39 years old, with an average age of  $31.46 \pm 3.29$ ; the patients in intervention group 2 were 23–38 years old, with an average age of  $30.29 \pm 3.17$ ; the patients in intervention group 3 were 23–39 years old, with an average age of  $31.59 \pm 2.37$ . The differences in general patient data were not statistically significant ( $P > 0.05$ ).

### **2.2. Intervention**

Upon admission, patients in the conventional group underwent routine postpartum pelvic floor rehabilitation, *i.e.*, Kegel exercises, while patients in the intervention group underwent individualized postpartum pelvic floor rehabilitation.

Patients in intervention group 1 underwent rehabilitation at 6–8 weeks postpartum; those in intervention group 2 underwent rehabilitation at 8–10 weeks postpartum; and patients in intervention group 3 underwent rehabilitation at 10–13 weeks postpartum. The MLD B-2T postpartum rehabilitation instrument (Nanjing Milan, China) was used to carry out pelvic floor rehabilitation. Before treatment, Glazer Protocol was used to evaluate the pelvic floor muscle strength of the patients, and B-ultrasound of the pelvic floor was performed. The patients were under a comprehensive pelvic rehabilitation plan, which includes: (i) low-frequency electrical stimulation of the pelvic floor, in which a probe is placed in the vagina, and the pulse current is set according to the tolerability of the puerpera; the low-frequency electrical stimulation causes the pelvic floor muscles to contract, thereby strengthening the pelvic floor muscles; during the electrical stimulation, the intensity of current should be such that the puerpera feels strong contraction, yet comfortable and painless; the pulse current should be set at 60 mA, and the duration should be about 30 minutes; (ii) biofeedback, in which a vaginal probe is placed in the vagina, and the puerpera is instructed to contract her pelvic floor muscles; then, graphical feedback is given to increase the puerpera's enthusiasm for exercise; in addition, the nurses would introduce the functions of different muscles in detail and guide the puerpera in controlling her muscles, so as to accelerate pelvic function recovery; (iii) scenario simulation, in which a probe is placed in the vagina to simulate scenarios of increased negative pressure, such as when coughing, and the puerpera is instructed to contract her pelvic muscles to increase the negative pressure, so as to practice the reflexive action of protecting the pelvic floor; (iv) breathing exercises, in which abdominal breathing is taught to relax the pelvic floor, especially in women with hypertonic pelvic floor muscles. The interventions were carried out for 2 consecutive months.

### **2.3. Observation indicators**

- (i) The indicators of pelvic floor muscle function used in this study include the strength of type I muscle fibers, the strength of type II muscle fibers, and the duration of contraction of type I muscle fibers.
- (ii) A self-made questionnaire was used to observe the incidence of adverse reactions in patients, including stress urinary incontinence, pelvic organ prolapse, and infection.

## 2.4. Statistical analysis

SPSS 21.0 was used for data processing. Variable data were mean  $\pm$  standard deviation (s) and tested by *t*-test, while qualitative data were expressed in percentage (%) and verified by chi-square ( $\chi^2$ ).  $P < 0.05$  was considered statistically significant.

## 3. Results

### 3.1. Maternal pelvic floor muscle function

The pelvic floor muscle strength, type I muscle fiber contraction duration, and other indicators of the intervention group were better than those of the conventional group, and the differences were statistically significant ( $P < 0.05$ ). See **Table 1** for details.

**Table 1.** Comparison of maternal pelvic floor muscle function

Group	Number of cases	Type I muscle fiber strength (%)	Type II muscle fiber strength (%)	Type I muscle fiber contraction duration (s)
Intervention group 1	46	28 (71.74%)	18 (28.26%)	5.32 $\pm$ 1.16
Intervention group 2	46	28 (60.87%)	18 (39.13%)	5.27 $\pm$ 1.20
Intervention group 3	46	30 (65.22%)	16 (34.78%)	5.10 $\pm$ 0.93
Conventional group	46	32 (47.83%)	14 (52.17%)	4.21 $\pm$ 1.01

### 3.2. Adverse reactions

The incidence of adverse reactions in the intervention group was lower than that in the conventional group, and the difference was statistically significant ( $P < 0.05$ ). See **Table 2** for details.

**Table 2.** Comparison of incidence of adverse reactions

Group	Number of cases	Stress urinary incontinence	Pelvic organ prolapse	Infection	Incidence rate
Intervention group 1	46	2	0	1	6.52%
Intervention group 2	46	1	1	0	4.45%
Intervention group 3	46	1	0	2	6.52%
Conventional group	46	6	3	4	28.26%

## 4. Discussion

The pelvic floor muscles are composed of multiple layers of muscles and fascia, which are rich in elastic fibers and can provide elasticity and support for the pelvic floor organs. Pregnancy and childbirth are relatively unique physiological events in females. Significant fluctuations in estrogen levels and altered collagen metabolism in pelvic floor connective tissues are evident during pregnancy and childbirth. These changes weaken the support function of the pelvic floor. Moreover, as the fetus continues to grow during pregnancy, the uterus enlarges; along with the weight of the amniotic fluid and placenta, the pelvic floor muscles are stretched over a period of time, resulting in injuries that might lead to complications such as pelvic organ prolapse, stress urinary incontinence, and sexual dysfunction. Maintaining the normal function of the pelvic floor is the key to maintaining the health of women. Therefore, it is necessary to restore the function of their pelvic floor muscles after delivery. The early postpartum period is the best time for recovery of neuromuscular injuries. If active care is not given, the function of the pelvic floor in these women will be affected to a great extent. Improving the pelvic floor muscle function is the most important

step in postpartum rehabilitation. Studies have found that women over the age of 50 with reproductive history have a 50% chance of pelvic organ prolapse. Chinese women, however, are more conservative when comes to matters pertaining to their private parts owing to the influence of tradition. Hence, they tend to pay less attention to minor issues that have no bearing on their quality of life. They often only seek medical attention when the issue worsens. This would affect the prognosis and affect their quality of life. In personalized postpartum rehabilitation, targeted pelvic floor rehabilitation is carried out on the basis of understanding postpartum pelvic floor injuries. After delivery, it is necessary to evaluate the pelvic floor function. Based on the results, rehabilitation measures such as electrical stimulation therapy, biofeedback, scenario simulation, and Kegel exercises are adopted, the intensity of therapy is adjusted accordingly, while ensuring purposeful, predictable, and targeted intervention, and the quality of nursing is improved [1].

Postpartum pelvic floor muscle training is a non-invasive, painless, non-surgical rehabilitation training program that strengthens the physiological feedback function. Although the practical value of early pelvic floor muscle training in preventing pelvic organ prolapse and improving the quality of life of women is recognized worldwide, this intervention is still developing in China. The time during which this intervention is carried out is related to the recovery of women's pelvic floor function. In the postpartum stage, earlier rehabilitation care is conducive to the recovery of the pelvic floor function. Based on the rehabilitation standard, when performing pelvic floor muscle contraction, type I fibers are given priority, followed by type II fibers [2]. Therefore, during rehabilitation, nurses need to adopt appropriate methods to control the intensity of training and the duration of contraction of type I fibers. Generally, pelvic floor rehabilitation is commenced 42 days after delivery and once lochia has subsided. This rehabilitation helps strengthen pelvic floor muscles and improves nerve function, so that the vagina will be in the best state and size again, thereby reducing the risk of pelvic floor disorders.

Bioengineering technology is used in pelvic floor functional rehabilitation. With high-tech therapeutic equipment, patients are provided with personalized treatment plans. At the same time, electrical stimulation, biofeedback, and scenario simulation can be used to stimulate the damaged pelvic floor, tighten the vagina, and relax vaginal muscles, thereby improving the quality of life of patients. The methods to repair damaged muscles and nerves include pelvic floor muscle training, electrical stimulation, biofeedback, and scenario simulation. Pelvic floor assessment and biofeedback therapy are based on the measurements of guided surface electromyography and guided vaginal contraction, which are fed back into the electromyography or pressure curves through effect display and sound prompts. In that way, patients would have a clearer understanding of their own pelvic floor muscle function and actively participate in the treatment process [3]. Pelvic floor muscles return to the normal state at a faster rate when stimulated by personalized electrical stimulation on this basis. It addresses postpartum vaginal anteroposterior wall bulging, urinary incontinence, pelvic organ prolapse, *etc.*, and has a good preventive effect on pelvic floor diseases.

According to a survey, the "golden period" for pelvic floor muscle function recovery is within one year. One to two weeks after delivery, Kegel exercises should be done at home. The intensity and time of exercise should be increased gradually. Start by contracting the anus and perineum for 5–10 seconds, relax, and then repeat it every 5–10 seconds, twice a day for 5 minutes or repeat the exercise 20–30 times in each set, totaling 3 sets per day. There should be a gradual increase in the amount of training. The longer it is, the better [4]. Once lochia has subsided, about 42 days after delivery, a pelvic floor function examination should be performed. If there are problems, measures must be taken as soon as possible, and systematic pelvic floor rehabilitation exercises should be initiated at once. The effect is better with early exercise. However, if the exercises are not done correctly, stress urinary incontinence, pelvic organ prolapse, and sexual dysfunction may develop with aging, leading to progressive worsening of symptoms as a result of decreased estrogen levels and muscle strength. The present study showed that the pelvic floor muscle function of the intervention group was significantly better than that of the conventional group after intervention ( $P < 0.05$ ).

However, there were no significant differences in the indicators among intervention group 1, intervention group 2, and intervention group 3 ( $P > 0.05$ ). This indicates that early individualized postpartum pelvic floor rehabilitation has high clinical value, as its application in puerpera can significantly promote the improvement of pelvic floor muscle function. The main reason for pelvic floor complications in puerpera, including weakening of muscles, pelvic organ prolapse, *etc.*, is the prolonged stretching of pelvic floor muscles as a result of the continuous growth and development of the fetus and the enlarged uterus<sup>[5,6]</sup>. Hence, more attention should be paid to early pelvic floor rehabilitation in clinical practice. In this study, the intervention group received individualized postpartum pelvic floor rehabilitation at 6–8 weeks, 8–10 weeks, and 10–13 weeks postpartum, and the results showed that individualized postpartum pelvic floor rehabilitation can effectively promote the recovery of pelvic floor muscle function<sup>[7,8]</sup>. Moreover, the early implementation of this rehabilitation can also effectively reduce the incidence of adverse events. The incidence of adverse events such as stress urinary incontinence, pelvic organ prolapse, and infection in the intervention group was significantly less than that in the conventional group ( $P < 0.05$ ). However, the difference in incidence of adverse events among intervention groups 1, 2, and 3 was insignificant ( $P > 0.05$ ). The results are consistent with those of other clinical studies, indicating that early individualized postpartum pelvic floor rehabilitation for puerpera can effectively prevent or reduce the incidence of postpartum adverse events, improve the quality of life, and aid the recovery of pelvic floor muscles, although it has no significant effect on the occurrence of adverse events at different time points in the early postpartum period<sup>[9]</sup>. In view of the influence of factors such as time and samples, early individualized postpartum pelvic floor rehabilitation has a certain impact on the intervention effect in mothers after normal vaginal delivery, and additional clinical trials are needed<sup>[10,11]</sup>.

In conclusion, the clinical application of early individualized pelvic floor rehabilitation in puerpera is of great significance to promote the rehabilitation of pelvic floor function, reduce the incidence of adverse events, and ensure the physical and mental health of puerpera. However, no significant difference was observed in the effects of individualized postpartum pelvic floor rehabilitation at different time points in the early postpartum period.

### Disclosure statement

The author declares no conflict of interest.

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# Curative Effect and Complication Rate of Abdominal Myomectomy and Laparoscopic Myomectomy in the Treatment of Uterine Fibroids

Shuihua Li\*

Nanfeng Maternity and Child Care and Family Planning Service Center, Fuzhou 344500, Jiangxi Province, China

\*Corresponding author: Shuihua Li, lyx2lishuihua@163.com

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**Abstract:** *Objective:* To compare and analyze the clinical efficacy and complication rate of abdominal myomectomy with those of laparoscopic myomectomy in uterine fibroids. *Methods:* This study was carried out from January 2021 to January 2023 on 150 patients with uterine fibroids. The patients were divided into two groups, a study group (n = 75) and a control group (n = 75), by digital table grouping. Patients in the control group underwent abdominal myomectomy, whereas patients in the study group underwent laparoscopic myomectomy. Surgery-related indicators, incidence of complications, ovarian function indicators, recurrence rate, and pregnancy rate were compared between the two groups. *Results:* The surgery-related indicators of the study group were lower than those of the control group ( $P < 0.05$ ); the incidence of postoperative complications was lower in the study group than in the control group ( $P < 0.05$ ); the postoperative ovarian function indicators of the study group were lower than those of the control group ( $P < 0.05$ ); there were no significant differences in postoperative recurrence rate and pregnancy rate between the two groups ( $P > 0.05$ ). *Conclusion:* For patients with uterine fibroids, abdominal myomectomy and laparoscopic myomectomy have similar recurrence and pregnancy rates, but laparoscopic myomectomy can shorten the recovery time and reduce the incidence of complications and the impact on ovarian function. Therefore, the latter should be applied in clinical settings.

**Keywords:** Abdominal myomectomy; Laparoscopic myomectomy; Uterine myoma; Complications

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## 1. Introduction

Uterine fibroids are common benign tumors of the reproductive system in women aged 30–50. They are formed by hyperplasia of uterine smooth muscle tissue. In the early stage of the disease, patients may not have any obvious discomfort. As the tumor volume increases, it may lead to abnormal menstruation, symptoms of tumor compression, lower abdominal discomfort, abnormal vaginal discharge, and other symptoms. It may also affect pregnancy. Surgery is the main treatment option for uterine fibroids. Through intraoperative operations, the tumor can be removed, and symptoms can be relieved [1]. Myomectomy allows the removal of fibroids, while maintaining the relative integrity of the uterus and preserving the patient's reproductive function. This procedure is suitable for patients who wish to have children in the future. Abdominal myomectomy is widely used clinically and has certain advantages. It is a simple procedure and provides a clear field of vision, but the surgical trauma is large, and the recovery time is long [2]. Laparoscopic myomectomy, on the other hand, is a minimally invasive procedure, which can reduce blood loss and interference to the internal environment of the body as well as shorten the recovery time [3].

In this study, 150 patients with uterine fibroids were selected to compare and analyze the curative effect and complication rate of abdominal and laparoscopic myomectomy.

## **2. Materials and methods**

### **2.1. General information**

This study was carried out from January 2021 to January 2023. A total of 150 patients with uterine fibroids admitted to our hospital were selected and divided into two groups, a study group ( $n = 75$ ) and a control group ( $n = 75$ ), by digital table grouping. The age range of the patients in the study group was 32–44, with an average of  $38.75 \pm 2.69$  years, and the duration of disease ranged from 5 to 18 months, with an average of  $11.59 \pm 2.76$  months. The age range of the patients in the control group was 31–46, with an average of  $38.86 \pm 2.73$  years, and the duration of the disease ranged from 4 to 18 months, with an average of  $11.52 \pm 2.71$  months. There were no significant differences in general data between the two groups ( $P > 0.05$ ).

Inclusion criteria: (i) patients who met the diagnostic criteria for uterine fibroids; (ii) patients with indications for myomectomy; (iii) patients who voluntarily cooperated in this study.

Exclusion criteria: (i) patients with other uterine diseases; (ii) patients with malignant endometrial lesions; (iii) patients with uterine fibroids at uncommon sites.

### **2.2. Surgical procedure**

The patients in the control group underwent abdominal myomectomy. The patients were kept in a supine position, and general anesthesia was initiated under tracheal intubation. After the anesthesia had taken effect, an incision of 6–8 cm in length was made over the lower abdomen. The myometrium was separated, and the peritoneal tissue was opened. The position of the uterus was determined by exploration, and the uterus was lifted with surgical instruments. The location, size, and number of fibroids were observed. The uterine fibroids were clamped and lifted. Blunt separation of the fibroids and surrounding tissues was performed, completely removing the uterine fibroids. The uterus was returned to the pelvic cavity after the procedure, and the pelvic cavity was washed with normal saline. The incision was sutured after hemostasis.

The patients in the study group underwent laparoscopic myomectomy. The patients were kept in the bladder lithotomy position, and general anesthesia was initiated under endotracheal intubation. After the anesthesia had taken effect, a longitudinal incision of 1 cm in length was made over the upper edge of the patient's umbilicus. An artificial carbon dioxide gas peritoneum (pressure was 12–14 mmHg) was established using a Veress needle introduced through a periumbilical puncture. After creating a pneumoperitoneum, the Veress needle was withdrawn, two incisions of 5 mm in length were further made above the level of the pubic symphysis on the left and right lower abdomen to insert the trocar and laparoscope, respectively. The laparoscope was used to observe the anatomical location, size, and quantity of uterine fibroids, determine the type of fibroids, and decide on the removal plan. For subserosal fibroids without uterine fibroid pedicle, the uterine fibroid capsule was cut circularly. The uterine fibroids were removed, and the uterus was sutured. For uterine fibroids connected to the uterus through the pedicle, the pedicle was tied, the uterine fibroids were removed about 0.5 cm above the knotted area, and electrocoagulation was performed to stop the bleeding. For intramural fibroids, 12 U of pituitary hormone was injected into the myometrial tissue around the most prominent part of the uterine fibroids, the most prominent part of the uterine fibroids was cut, and pulling and rotating motions were performed to remove the fibroids. The uterus was sutured, and electrocoagulation was performed to stop bleeding. The pelvic cavity was flushed with normal saline, the uterus was sutured, the pneumoperitoneum was relieved, and the abdominal cavity was closed after the surgical instruments were taken out. Postoperatively, the pelvic tissue was monitored for active bleeding, and antibiotics were used to prevent infection.

### 2.3. Outcome evaluation

- (i) The surgery-related indicators of both groups of patients, including intraoperative blood loss, time to ambulation, time to first passage of flatus, and length of hospital stay, were observed and compared.
- (ii) The incidence of postoperative complications in both groups of patients was compared.
- (iii) Before surgery and 3 months after surgery, 3 mL of fasting venous blood samples were collected from both groups of patients, and colloidal gold technique was used to detect the levels of luteinizing hormone (LH) and follicle-stimulating hormone (FSH).
- (iv) The two groups of patients were followed up 6 months postoperatively, and the pregnancy rate and recurrence rate were determined.

### 2.4. Statistical analysis

SPSS 23.0 was used for data analysis. Measurement data were expressed as mean  $\pm$  standard deviation, and *t*-test was used. Count data were expressed as percentage (%), and  $\chi^2$  test was used.  $P < 0.05$  indicated statistically significant difference.

## 3. Results

### 3.1. Surgery-related indicators

As shown in **Table 1**, the surgery-related indicators of the study group were lower than those of the control group ( $P < 0.05$ ).

**Table 1.** Comparison of surgery-related indicators between the two groups of patients

Group	Intraoperative blood loss (mL)	Time to ambulation (h)	Time to first passage of flatus (h)	Length of hospital stay (d)
Study group (n = 75)	81.25 $\pm$ 4.77	25.64 $\pm$ 2.82	16.84 $\pm$ 1.93	4.05 $\pm$ 1.12
Control group (n = 75)	129.48 $\pm$ 7.95	33.75 $\pm$ 4.69	27.52 $\pm$ 2.86	6.94 $\pm$ 1.88
<i>t</i>	45.052	12.834	26.807	11.437
<i>P</i>	0.000	0.000	0.000	0.000

Data are expressed as mean  $\pm$  standard deviation.

### 3.2. Incidence of postoperative complications

As shown in **Table 2**, the incidence of postoperative complications of the study group was lower than that of the control group ( $P < 0.05$ ).

**Table 2.** Comparison of the incidence of postoperative complications between the two groups

Group	Surgical site infection	Pelvic adhesions	Frequent urination	Complication rate
Study group (n = 75)	0	1	2	3 (4.0)
Control group (n = 75)	3	4	3	10 (13.3)
$\chi^2$				4.126
<i>P</i>				0.042

Data are expressed as n (%).

### 3.3. Ovarian function indicators

As shown in **Table 3**, the postoperative ovarian function indicators of the study group were lower than those of the control group ( $P < 0.05$ ).

**Table 3.** Comparison of ovarian function indicators between the two groups

Group	LH (U/L)		FSH (U/L)	
	Preoperative	Postoperative	Preoperative	Postoperative
Study group (n = 75)	18.22 ± 1.45	18.75 ± 1.64	18.44 ± 1.68	20.11 ± 1.62
Control group (n = 75)	18.29 ± 1.38	22.03 ± 2.19	18.47 ± 1.73	24.35 ± 2.24
<i>t</i>	0.303	10.382	0.108	13.283
<i>P</i>	0.762	0.000	0.914	0.000

Data are expressed as mean ± standard deviation.

### 3.4. Pregnancy and recurrence rates

As shown in **Table 4**, there were no significant differences in postoperative pregnancy and recurrence rates between the two groups ( $P > 0.05$ ).

**Table 4.** Comparison of pregnancy and recurrence rates between the two groups

Group	Pregnancy rate	Recurrence rate
Study group (n = 75)	38 (50.7)	3 (4.0)
Control group (n = 75)	35 (46.7)	4 (5.3)
$\chi^2$	0.240	0.149
<i>P</i>	0.624	0.698

Data are expressed as n (%).

## 4. Discussion

Uterine fibroids are common benign tumors in gynecology. The etiology of uterine fibroids is related to genetics and abnormal levels of sex hormones. There are various types of uterine fibroids, including submucosal fibroids, subserosal fibroids, intramural fibroids, *etc.* Patients with uterine fibroids commonly present with dysmenorrhea, increased menstrual flow, compression symptoms, abnormal leukorrhea, pain and swelling over the lower abdomen, *etc.* [4]. Clinically, patients with uterine fibroids are treated with surgery. Myomectomy is a procedure to remove fibroids, while preserving the uterus, thereby satisfying patients' reproductive needs. Myomectomy is currently the mainstream surgical solution for uterine fibroids [5].

Abdominal myomectomy is a conventional treatment for uterine fibroids. It has a wide range of surgical indications and can be applied to the treatment of uterine fibroids in different locations, volumes, and numbers. The surgical field of view is wide and clear, allowing the surgeon to palpate them. Submucosal fibroids and small fibroids can be found. The lesions are clearly exposed during the procedure, and the fibroids can be removed completely. In abdominal myomectomy, a long and deep incision is made. This seriously interferes with the internal environment of the body during the surgery. The incidence of complications during the postoperative recovery period is high, and the recovery time is long. On the other hand, laparoscopic myomectomy is a minimally invasive technique. Its main advantages are as follows: (i) since a laparoscope is inserted through a small incision during surgery to observe the fibroids, the number, anatomical location, and size of the fibroids can be determined and physicians can remove the uterine fibroids under direct vision, thus ensuring the completeness of procedure [6]; (ii) electrocoagulation is used in laparoscopic myomectomy to stop bleeding, and the precision of the procedure contributes to preventing injury to the surrounding tissues and organs of the myoma and reducing the amount of blood loss during surgery; (iii) the operation environment is relatively closed, and the operation accuracy is high, which can

reduce the interference to the internal environment of the body; in addition, the incision is small, which can shorten the postoperative recovery time and reduce the risk of postoperative complications [7].

The present study showed that the surgery-related indicators of the study group were better than those of the control group, suggesting that laparoscopic myomectomy can reduce intraoperative blood loss and shorten postoperative recovery time. Analyzing the reason, laparoscopic myomectomy is performed through a small incision, and bipolar electrocoagulation is performed to stop the bleeding, thus completing hemostasis. During the procedure, magnification of the laparoscope is used to prevent damage to surrounding tissues and organs; in that way, patients lose less blood during surgery. Laparoscopic myomectomy is also performed in a relatively closed environment, which can keep the internal environment of the body stable. The small incision can reduce postoperative pain at the incision site, thereby shortening the recovery time and length of hospital stay [8]. Moreover, the results showed that the incidence of postoperative complications in the study group was lower than that in the control group, suggesting that laparoscopic myomectomy can reduce the incidence of postoperative complications. Analyzing the reasons, since laparoscopic myomectomy adopts a small incision approach, the incidence of surgical site infection is low, and since patients can ambulate early after surgery and the time to first flatus is shortened, the incidence of complications such as pelvic adhesions and frequent urination is low. In the present study, the postoperative ovarian function indicators of the study group were lower than those of the control group, suggesting that laparoscopic myomectomy can reduce the impact on ovarian function. Analyzing the reasons, since the incision is small and the procedure follows a minimally invasive approach, the stability of the adrenaline system can be maintained, the release of LH and FSH can be inhibited, the level of hormones in the body can be controlled, and the impact of surgery on ovarian function can be reduced [9]. This study showed that there were no significant differences in postoperative recurrence and pregnancy rates between the two groups, suggesting a similar efficacy between abdominal myomectomy and laparoscopic myomectomy in the long run. Although both abdominal myomectomy and laparoscopic myomectomy can achieve good therapeutic outcomes, the laparoscopic approach results in less surgical trauma and can accelerate the recovery process, underwriting its value in clinical application and promotion. At the same time, not all patients with uterine fibroids are suitable for laparoscopic myomectomy. If the patient has multiple uterine fibroids that are large in diameter and located at uncommon areas, conventional abdominal myomectomy is recommended. During laparoscopic myomectomy, surgeons must be skilled in the major components of the procedure, standardize the approach, remove the myoma, and constantly sum up their experience in practice to improve the surgical effect [10].

In conclusion, although the postoperative pregnancy and recurrence rates of patients with uterine fibroids treated by abdominal myomectomy and laparoscopic myomectomy are similar, the latter approach can shorten the recovery time, reduce the incidence of complications, and alleviate the impact on ovarian function. Therefore, the procedure should be widely used in clinical settings. Considering the small sample size of the present study, the short study duration, and that no comparative research and analysis of the same type of data were carried out, the mechanism of removal via treatment still requires further exploration.

### **Disclosure statement**

The author declares no conflict of interest.

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# Analysis of the Influence of Nifedipine + Magnesium Sulfate Therapy on the Clinical Effect of Pregnancy-Induced Hypertension, Renal Function, and Pregnancy Outcome

Yaqin Yang<sup>†</sup>, Liping Zhao<sup>\*</sup>

The Third Hospital of Inner Mongolia Baotou Iron and Steel Group, Baotou 014010, Inner Mongolia Autonomous Region, China

<sup>\*</sup>*Corresponding author:* Liping Zhao, [zlpingovh@126.com](mailto:zlpingovh@126.com)

<sup>†</sup>*First author:* Yaqin Yang, [lzg8yyq@126.com](mailto:lzg8yyq@126.com)

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**Abstract:** *Objective:* To investigate the effect of nifedipine + magnesium sulfate treatment on pregnancy-induced hypertension. *Methods:* From January 2020 to January 2023, 60 patients with pregnancy-induced hypertension in our hospital were randomly divided into the control group and the observation group (30 cases in each group). The control group was treated with magnesium sulfate, while the observation group was treated with nifedipine and magnesium sulfate, and the clinical efficacy of the two groups was compared. The effective rate of treatment, blood pressure indicators, renal function indicators, adverse pregnancy outcomes, and quality-of-life scores were investigated. *Results:* The effective rate of treatment and quality-of-life score in the observation group were higher than those in the control group ( $P < 0.05$ ). On the other hand, the diastolic and systolic blood pressure, the 24 h urine creatinine and albumin, as well as the adverse pregnancy outcomes were found to be lower in the observation group as compared to the control group ( $P < 0.05$ ). *Conclusion:* For patients with pregnancy-induced hypertension, treatment with nifedipine and magnesium sulfate can achieve significant curative and remarkable effects. While improving blood pressure, it can also improve renal function, optimize pregnancy outcomes, and improve quality of life.

**Keywords:** Nifedipine; Magnesium sulfate; Pregnancy-induced hypertension; Clinical effect; Renal function; Pregnancy outcome

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## 1. Introduction

Pregnancy-induced hypertension, commonly referred to as PIH, is a special disease during pregnancy [1]. Clinically, the patient's symptoms include edema, urinary protein, high blood pressure, *etc.* Dizziness, vertigo, headache, and other symptoms were experienced by patients in serious cases, whereas coma, convulsions, and other consequences were noted in severe cases [2]. Whilst the pathogenesis of pregnancy-induced hypertension is unknown, it is necessary to take measures such as lowering blood pressure, relieving spasms, and improving blood circulation according to the specific pathophysiological characteristics of patients and disease-inducing factors [3,4]. The commonly used antispasmodic agent clinically is magnesium sulfate, which is an antispasmodic drug that can promote the recovery of

microcirculation, but the curative effect of a single drug is limited. Nifedipine, a calcium-blocker medication, has a significant protective effect on cardiomyocytes and also the effect of dilating blood vessels. It is a commonly used antihypertensive drug in clinical practice. A combination of magnesium sulfate and nifedipine may improve renal function and clinical efficacy. The study aimed to evaluate the curative effect of nifedipine + magnesium sulfate combined treatment on patients with pregnancy-induced hypertension.

## 2. Materials and methods

A retrospective study was carried out between January 2020 to January 2023 at the Third Hospital of Inner Mongolia Baotou Iron and Steel Group, China. Inclusion criteria included patients being diagnosed with pregnancy-induced hypertension, with a normal mind, and able to communicate normally. Exclusion criteria included patients with mental illnesses, cancer, and those who were transferred to the hospital for treatment in the middle of the study. Sixty patients who fulfilled the inclusion criteria were recruited, informed, and signed the consent form. They were then randomly divided into two groups: the control group and the observation group.

The control group was treated with magnesium sulfate, which was applied through intravenous infusion. Patients in the control group were given 5 g of magnesium sulfate mixed with 20 mL of glucose solution over 24 h, followed by a maintenance dose of 10 g of magnesium sulfate in 500 mL glucose solution every 48 h.

The observation group was treated with a combination of nifedipine and magnesium sulfate, where magnesium sulfate was administered via intravenous infusion with doses similar to the control group, while nifedipine was taken orally at 10 mg daily. The total treatment duration was 14 days. During treatment, the patient's blood pressure was closely monitored, and magnesium toxicity was taken into account.

The observation indicators in the study included: (i) treatment efficiency, which was observed and categorized as (a) significantly effective (blood pressure below 140/90mmHg; urine protein, edema, and other symptoms disappeared), (b) effective (blood pressure between 140–150/90–100 mmHg; urine protein, edema, and other symptoms improved significantly), and (c) ineffective (did not meet the above requirements); (ii) blood pressure indicators (diastolic and systolic blood pressure); (iii) renal function indexes (24 h urine creatinine and 24 h urine albumin); (iv) adverse pregnancy outcomes; and (v) quality of life using the SF-36 scale (0–100 points), where a higher score indicated a better quality of life.

SPSS2 3.0 was used for data analysis and processing. Measurement data (mean  $\pm$  standard deviation, SD) and count data (%) were tested by *t* and  $\chi^2$ , respectively, and the difference was considered statistically significant when  $P < 0.05$ .

## 3. Results

**Table 1** shows the comparison of data between the control group and the observation group, including age range, average age (mean  $\pm$  SD), gestational week range, and average gestational week (mean  $\pm$  SD).

**Table 1.** Data comparison of the two groups

Group	Number of cases (n)	Age range (years)	Average age (years)	Gestational weeks (weeks)	Average gestational week (weeks)
Control group	30	20–36	27.45 $\pm$ 3.26	28–38	36.59 $\pm$ 2.50
Observation group	30	20–37	27.51 $\pm$ 3.35	28–39	36.48 $\pm$ 2.71
$\chi^2/t$ (%)		–	0.062	–	0.185
<i>P</i>		–	0.485	–	0.625

The treatment effective rate between the control group and the observation group after the treatment is shown in **Table 2**. Whilst the control group had more effective cases (83.33%) and a few ineffective cases (16.67%), the observation group showed that all cases were effective (100%), where the effective cases were slightly more than the significantly effective cases (53.33% versus 46.67%). Hence, the rate of treatment effectiveness found in the observation group was significantly higher than that observed in the control group ( $P = 0.020$ ).

**Table 2.** The treatment effective rate of the two groups

Group	Number of cases (n)	Significantly effective	Effective	Ineffective	Total effective rate
Control group	30	10 (33.33)	15 (50.00)	5 (16.67)	25 (83.33)
Observation group	30	14 (46.67)	16 (53.33)	0 (0.00)	30 (100.00)
$\chi^2$	-	1.111	0.067	5.455	5.455
$P$	-	0.292	0.796	0.020	0.020

Data are given in n (%).

The blood pressure indicators of the two groups before and after the treatment are shown in **Table 3**. Patients in both groups had lower diastolic and systolic blood pressure after treatment. However, the observation group appeared to have a lower blood pressure than those of the control group (diastolic blood pressure  $81.48 \pm 2.36$  versus  $85.26 \pm 8.20$ ,  $P = 0.000$ ; systolic blood pressure  $130.15 \pm 2.11$  versus  $135.26 \pm 8.56$ ,  $P = 0.000$ ).

**Table 3.** Blood pressure indicators of the two groups

Group	Number of cases (n)	Diastolic blood pressure (mmHg)		Systolic blood pressure (mmHg)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	30	$104.15 \pm 6.26$	$85.26 \pm 8.20$	$154.28 \pm 9.25$	$135.26 \pm 8.56$
Observation group	30	$104.48 \pm 6.35$	$81.48 \pm 2.36$	$154.19 \pm 9.18$	$130.15 \pm 2.11$
$t$	-	0.261	9.265	0.185	10.265
$P$	-	0.845	0.000	0.478	0.000

Data are given in mean  $\pm$  SD.

**Table 4** showed the renal function indexes of the two groups before and after the treatment. Both groups showed a decrease in 24 h urine creatinine and albumin after the treatment, where the amounts were lower in the observation group as compared to the control group (creatinine  $7.45 \pm 0.26$  versus  $9.26 \pm 1.52$ ,  $P = 0.000$ ; albumin  $125.26 \pm 4.08$  versus  $140.26 \pm 11.50$ ,  $P = 0.000$ ).

**Table 4.** Renal function indexes of the two groups

Group	Number of cases (n)	24 h urine creatinine (mmol/L)		24 h urine albumin (mg)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	30	$10.45 \pm 2.65$	$9.26 \pm 1.52$	$180.56 \pm 50.26$	$140.26 \pm 11.50$
Observation group	30	$10.51 \pm 2.71$	$7.45 \pm 0.26$	$181.01 \pm 50.41$	$125.26 \pm 4.08$
$t$	-	0.084	5.948	0.162	9.584
$P$	-	0.695	0.000	0.487	0.000

Data are given in mean  $\pm$  SD.

The adverse pregnancy outcomes of both groups after the treatment are shown in **Table 5**, where there were lesser adverse pregnancy outcomes observed in the observation group as compared to the control group (total incidence of 3.33% versus 23.33%,  $P = 0.023$ ).

**Table 5.** Adverse pregnancy outcomes of the two groups

Group	Number of cases (n)	Neonatal asphyxia	Respiratory distress	Premature rupture of membrane	Fetal macrosomia	Total incidence
Control group	30	2 (6.67)	2 (6.67)	2 (6.67)	1 (3.33)	7 (23.33)
Observation group	30	1 (3.33)	0 (0.00)	0 (0.00)	0 (0.00)	1 (3.33)
$\chi^2$	-	0.351	2.069	2.069	1.017	5.192
$P$	-	0.554	0.150	0.150	0.313	0.023

Data are given in n (%).

The quality-of-life score between the control group and the observation group is shown in **Table 6**. The quality of life of the observation group in terms of vitality, physiological functions, emotional functions, and social functions appeared to be higher than that of the control group ( $P = 0.000$ ).

**Table 6.** The quality-of-life score of the two groups

Group	Number of cases (n)	Vitality (points)		Physiological functions (points)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	30	52.48 ± 8.15	60.36 ± 7.15	51.39 ± 8.15	61.59 ± 8.36
Observation group	30	52.36 ± 8.20	72.95 ± 2.15	51.48 ± 8.20	75.20 ± 2.19
$t$	-	0.265	8.595	0.018	9.265
$P$	-	0.889	0.000	0.487	0.000

Group	Number of cases (n)	Emotional functions (points)		Social function (points)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	30	53.48 ± 8.41	62.59 ± 6.26	51.39 ± 8.15	63.68 ± 7.22
Observation group	30	53.20 ± 8.19	72.51 ± 2.15	51.84 ± 8.20	73.61 ± 2.26
$t$	-	0.084	9.481	0.018	7.985
$P$	-	0.862	0.000	0.869	0.000

Data are given in mean ± SD.

#### 4. Discussion

During pregnancy, due to the increase of progesterone and luteinizing hormone in the body over time, the blood coagulation function and fibrinolytic activity in the body of pregnant women will change accordingly. However, if there is a disorder of the fibrinolytic and coagulation system, it is likely to cause pregnancy-induced hypertension, which is also clinically known as gestational hypertension [5,6]. When the disease develops to a certain stage, it may lead to spasms of small blood vessels throughout the patient's body, as well as certain damage to the vascular endothelium, which will aggravate the coagulation dysfunction, eventually leading to a hypercoagulable state and form a thrombus, which may endanger the health of the patients and fetuses [7,8]. Pregnancy-induced hypertension is the most common complication during pregnancy, and its occurrence is related to hemodynamic abnormalities caused by systemic small vessel spasms. The onset of pregnancy-induced hypertension is insidious, and the condition is critical. Some patients may manifest signs of organ failure or coma, which threatens the lives of women and fetuses [9].

In recent years, the incidence of pregnancy-induced hypertension has been increasing year by year, and the current annual incidence has reached 9% [10]. Pregnancy-induced hypertension not only poses a great threat to the health of mothers and infants but also causes maternal and perinatal deaths. Clinically, the patients' manifestations are mostly persistently elevated blood pressure, proteinuria, and edema. Some women with very mild symptoms suffer from mild dizziness and elevated blood pressure, and they do not feel any other discomfort at all [11,12]. However, when the situation becomes more serious, the patients will have various symptoms, such as dizziness, nausea, headache, vomiting, persistent right upper quadrant pain, *etc.*, along with a significant increase in blood pressure, a more serious situation of edema, and a large amount of proteinuria. Some patients also experience convulsions and coma. According to some surveys, the risk of "postpartum hemorrhage" is very high in the third trimester, and it will cause great harm to fetuses [13]. Therefore, adequate attention should be given to the prevention and treatment of the disease.

Currently, in the process of treating pregnancy-induced hypertension, doctors will conduct all-around observation of the mother's and baby's body, provide oxygen support promptly, and supply protein and calories on time. Patients with severe edema will require salt-intake control. The current commonly used antihypertensive drug in clinical practice is magnesium sulfate, which has the effect of dilating blood vessels and improving microcirculation. Magnesium ions in the drug can expand blood vessels and regulate blood pressure by inhibiting the contraction of vascular smooth muscle (VSM) and also reducing the resistance in blood vessels and spasm of small blood vessels [14]. Nifedipine is a calcium ion channel antagonist, which can inhibit the calcium ion from activating the calcium ion pump, thereby maintaining the calcium ion concentration in the blood [15]. In addition, nifedipine can expand blood vessels throughout the body to a certain extent, reduce peripheral blood pressure, and increase blood flow in uterine arteries. The combination of magnesium sulfate and nifedipine has a certain synergistic effect that can alleviate the stress damage on VSM cells and is beneficial to improving hemodynamic disorders. In addition, the use of nifedipine will increase the blood perfusion of the kidneys during treatment, thereby preventing oxidative stress damage of the glomerular filtration membrane caused by abnormal blood perfusion of the kidneys. The occurrence of pregnancy-induced hypertension is also closely related to oxidative stress. The changes in oxidative metabolism in the body likely lead to intensified oxidative stress in the body. Nifedipine can remove free radicals in the body and regulate the metabolism, thereby improving the antioxidant capacity in the body and significantly improving the renal function of patients. In this paper, the observation group obtained significant therapeutic effects after combining the above two drugs. Compared with the control group, which was given magnesium sulfate, the observation group had a higher effective rate, lower blood pressure indicators, better renal function indicators, and lower adverse pregnancy outcomes. Higher quality of life scores suggested that the combined use of nifedipine and magnesium sulfate is of significant value.

## 5. Conclusion

In summary, nifedipine and magnesium sulfate can be combined in the treatment of pregnancy-induced hypertension. The combination has a significant effect, can improve blood pressure indicators and renal function, and can well control pregnancy outcomes and reduce adverse events. After treatment, the quality of life of patients will be greatly improved.

## Disclosure statement

The authors declare no conflict of interest.

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# Effects of Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) in the Treatment of Chronic Cervicitis of Spleen Deficiency Type

Fajuan Tian\*, Qihong Fan

The First People's Hospital of Huangzhong District, Xining 811602, Qinghai Province, China

\*Corresponding author: Fajuan Tian, fqh2232350@163.com

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**Abstract:** *Objective:* To observe the effects of modified Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) in the treatment of chronic cervicitis of spleen deficiency type. *Methods:* From May 2021 to December 2022, 80 patients from our hospital (The First People's Hospital of Huangzhong District) were randomly divided into two groups (40 cases/group). Patients in the control group were treated with Western medicine, whereas patients in the observation group were treated with Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) on the basis of Western medicine. The effects (curative effect, traditional Chinese medicine [TCM] symptom scores, and incidence of adverse reactions) were compared between both groups. *Results:* Before treatment, the differences in TCM symptom scores and incidence of adverse reactions between the two groups were not statistically significant ( $P > 0.05$ ). Compared with the control group, the observation group had significantly lower TCM symptom scores after treatment and higher curative effect ( $P < 0.05$ ). *Conclusion:* For patients with chronic cervicitis of spleen deficiency type, Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) is effective. Significant improvement in symptoms is evident with the use of Buzhong Yiqi Decoction, and it has little side effects. Given its outstanding therapeutic advantages, its application should be advocated in clinical practice.

**Keywords:** Modified Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction); Spleen deficiency type; Chronic cervicitis; Symptom score

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## 1. Introduction

Chronic cervicitis is a common gynecological disease. Due to its long course, recurrent attacks, and difficulty in treatment, it affects patients physically and mentally and reduces the quality of life of patients. It has become a problem that plagues women, especially in women who have given birth <sup>[1,2]</sup>. In recent years, an increasing number of studies are focusing on the treatment of chronic cervicitis. Many studies have shown that traditional Chinese medicine (TCM) has a significant therapeutic effect on chronic cervicitis <sup>[3,4]</sup>. In order to study the effects of modified Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) in the treatment of chronic cervicitis of spleen deficiency type, 80 patients in our hospital were included in the study.

## 2. Materials and methods

### 2.1. General information

From May 2021 to December 2022, 80 patients, with age ranging from 25 to 55, were divided into two

equal groups according to the treatment received. Patients in the control group were treated with western medicine, whereas those in the observation group were treated with Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) on the basis of western medicine. The average age of the patients in the control group and the observation group was  $40.29 \pm 4.83$  and  $40.55 \pm 4.16$ , respectively; the difference between the two groups was insignificant ( $P > 0.05$ ).

Inclusion criteria: (i) patients diagnosed based on the diagnostic criteria; (ii) patients with symptoms of spleen deficiency; (iii) patients who actively participated in the research.

Exclusion criteria: (i) patients with gynecological tumors; (ii) patients with acute genital inflammation; (iii) patients with severe dysfunction of important organs, such as liver and kidney; (iv) patients with mental disorders; (v) patients with drug allergies.

## 2.2. Methods

Conventional western medicine: metronidazole 250–500 mL, intravenous infusion, qd; gentamicin sulfate 8–16 U + 0.9% sodium chloride solution 200 mL, intravenous infusion, qd; Baofukang vaginal suppository, qd, after cleaning the vulva every night before going to bed.

On this basis, patients in the observation group were treated with Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction). The prescription included dried ginger 5 g, dried tangerine peel 6 g, roasted licorice 8 g, cimicifuga 10 g, angelica 10 g, *Atractylodes macrocephala* 10 g, bupleurum 10 g, codonopsis 15 g, and astragalus 30 g, along with three slices of ginger and two jujubes. They were then decocted in water. The patients were required to take 200 mL, 100 mL in the morning and in the evening. All patients were required to take the medicine immediately on the day of treatment, with each course lasting 2 months. The physicians advised the patients to avoid eating cold, oily, spicy food, and engaging in strenuous activity while receiving therapy, as well as to refrain from having sexual intercourse.

## 2.3. Indicators

- (i) Therapeutic effect: markedly effective and effective refer to symptom alleviation, improved surface erosion, and a reduction in TCM symptom score by more than 1/3 after treatment; ineffective refers to no difference in symptoms and signs after treatment.
- (ii) TCM symptom score: main symptoms and secondary symptoms were scored separately based on the diagnostic criteria of TCM (main symptoms: 0–6 points; secondary symptoms: 0–3 points); the tongue and pulse were not scored; the more severe the symptoms, the higher the score.
- (iii) Incidence of adverse reactions: nausea, headache, and abdominal pain.

## 2.4. Statistical analysis

Data were processed using SPSS 22.0. Measurement data were expressed as mean  $\pm$  standard deviation, and *t*-test was used. Enumeration data were expressed as percentage (%), and  $\chi^2$  test was used.  $P < 0.05$  indicated that the difference was statistically significant.

## 3. Results

### 3.1. Curative effect

The total effective rate in the observation group was significantly higher than that in the control group ( $P < 0.05$ ), as shown in **Table 1**.

**Table 1.** Comparison of curative effect

Group	Number of cases	Markedly effective	Effective	Ineffective	Total effective rate
Observation group	40	21 (52.5)	16 (40.0)	3 (7.5)	37 (92.5)
Control group	40	14 (35.0)	14 (35.0)	12 (30.0)	28 (70.0)
$\chi^2$		2.489	0.213	6.646	6.646
<i>P</i>		0.115	0.644	0.010	0.010

### 3.2. TCM symptom scores

Before treatment, the differences in scores between the two groups were not statistically significant ( $P > 0.05$ ). However, after treatment, the TCM symptom scores were significantly lower in the observation group than in the control group ( $P < 0.05$ ), as shown in **Table 2**.

**Table 2.** Comparison of TCM symptom scores

Group	Number of cases	Abdominal pain (points)		Dysmenorrhea		Mammary fullness and distention		Prolonged menstruation	
		Before	After	Before	After	Before	After	Before	After
Observation group	40	5.71 ± 0.95	1.02 ± 0.21	2.96 ± 1.08	0.85 ± 0.10	2.85 ± 1.51	0.52 ± 0.09	2.89 ± 1.43	0.37 ± 0.01
Control group	40	5.84 ± 0.71	1.89 ± 0.14	2.85 ± 1.03	2.01 ± 0.35	2.51 ± 1.39	1.31 ± 0.51	2.73 ± 1.61	1.41 ± 0.24
<i>t</i>		0.693	21.801	0.466	20.953	1.048	9.648	0.470	27.383
<i>P</i>		0.490	0.000	0.642	0.000	0.298	0.000	0.640	0.000

Group	Number of cases	Mental depression		Anxiety and irritability		Nausea and vomiting	
		Before	After	Before	After	Before	After
Observation group	40	2.86 ± 1.46	0.98 ± 0.16	2.76 ± 1.63	0.73 ± 0.51	2.46 ± 1.86	0.43 ± 0.11
Control group	40	2.77 ± 2.31	1.99 ± 0.82	2.79 ± 1.04	1.96 ± 0.16	2.51 ± 1.30	2.08 ± 0.28
<i>t</i>		0.208	7.646	0.098	16.453	0.139	34.689
<i>P</i>		0.836	0.000	0.922	0.000	0.890	0.000

Note: Before and After refer to before treatment and after treatment, respectively.

### 3.3. Adverse reactions

The difference in incidence of adverse reactions between the two groups was not significant ( $P > 0.05$ ), as shown in **Table 3**.

**Table 3.** Comparison of adverse reactions

Group	Number of cases	Nausea	Abdominal pain	Headache	Total adverse reactions
Observation group	40	1 (2.5)	0 (0.0)	0 (0.0)	1 (2.5)
Control group	40	0 (0.0)	1 (2.5)	1 (2.5)	2 (5.0)
$\chi^2$		1.013	1.013	1.013	0.346
<i>P</i>		0.314	0.314	0.314	0.556

#### 4. Discussion

Chronic cervicitis is one of the common inflammations of the female genitalia. Sexual intercourse, childbirth, and uterine manipulation can damage the cervix and cause epithelial infection [5]. Treatment is mainly based on physical therapy, such as laser, freezing, and microwave, destroying the erosive epithelium, accelerating the growth of new epithelium, and promoting wound healing. It is generally believed that freezing technology is effective for the treatment of chronic cervical diseases and cervical basal cell hyperplasia. TCM believes that chronic cervicitis is a “leukorrhea disease.” Due to “dampness syndrome” caused by spleen and stomach qi deficiency, patients develop symptoms of spleen deficiency and qi depression. The trapped dampness-evil leads to the damp invasion of the lower energizer, causing vaginal discharge [6,7]. Therefore, the treatment should first focus on strengthening spleen-qi supplementation, improving spleen-yang to raise qi, promoting water-damp metabolism, and eliminating dampness.

In TCM, Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) is a commonly used prescription for the treatment of spleen deficiency, from Volume 2 of the ancient book *Must-Know Medicine (Bu Zhi Yi Bi Yao)*. It has the effects of invigorating the spleen and replenishing qi, nourishing blood, and quenching wind [8]. In addition, it invigorates the middle and replenishes qi, raising yang and lifting depression. It is specifically used in the treatment of gynecological spleen deficiency, which can effectively improve the symptoms of spleen and stomach qi deficiency, clear yang not rising, and depression of middle qi. It relieves qi deficiency and targets the weak pancreas and clear yang sinking into the lower energizer. Moreover, this prescription is also effective for chronic cervicitis under the category of “leukorrhea disease” in TCM. The main cause of leukorrhea is the invasion of damp-evil. In addition, heavy diet, overwork, or excessive worry can also result in abnormal transportation and transformation, retention of dampness and turbidity, damage to the two channels, and eventually cause leukorrhea. In order to treat this disease, it is necessary to regulate the spleen and stomach, improve yang qi in the body, and ensure that it emits moisture. Buzhong Yiqi Decoction, as the main formula, can be prepared based on the patient’s situation.

Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) with astragalus can improve the blood gas level in the body and promote wound healing. *Codonopsis pilosula* and *Atractylodes macrocephala* are auxiliary drugs that can enhance the function of the spleen and stomach [9]. The ancient book *Materia Medica Justice (Ben Cao Zheng Yi)* has pointed out the characteristics of these medicines, “especially valuable ones, invigorating the spleen but not dryness...nourishing blood without being greasy, encouraging clear yang, vibrating the qi without the disadvantage of rigidity and dryness.” According to the ancient book *Materia Medica Summary (Ben Cao Hui Yan)*, *Atractylodes macrocephala* has the effect of nourishing the spleen and stomach and aiding digestion [10]. Zhang Jingyue, a TCM master, believes that cimicifuga and bupleurum can strengthen yang qi, while angelica can promote blood circulation and wound healing, relieve pain, eliminate fluid, purify blood, and promote renewal; tangerine peel can enhance strength and aid digestion, while ginger can warm the body and also aid digestion; licorice, on the other hand, can be used in conjunction with other medicines. In order to achieve the purpose of strengthening the body, dispelling dampness, and removing blood stasis, a combination of multiple drugs can be used for treatment. Modern medical research has found that *Astragalus* can enhance the body’s anti-fatigue and anti-ulcer capabilities, and it also has a wide range of antibacterial functions [11,12]; *Codonopsis* can stimulate gastrointestinal motility and improve human immunity; *Atractylodes* can regulate intestinal function; tangerine peel has antioxidant properties and can regulate the function of the stomach; bupleurum has anti-inflammatory and immune-boosting effects, while angelica can improve the body’s immune system [13,14]. In conclusion, Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) can significantly improve the syndrome of spleen deficiency and qi depression, enhance the therapeutic effect, and improve the prognosis of patients. Its significant curative effect in the treatment of chronic cervicitis of spleen deficiency type is also evident in medical literature [15].

In this study, we investigated the effects of modified Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) in the treatment of chronic cervicitis of spleen deficiency type. The total effective rate of the observation group (92.5%) was significantly higher than that of the control group (70.0%). The combination of Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) and western medicine showed a high curative effect, suggesting that the drug combination has a definite effect and could improve the long-term curative effect. Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) is a typical TCM prescription. It is safe and reliable and has been used clinically for many years without any reported adverse reaction. This study showed that the incidence of adverse reactions in the observation group was slightly lower than that in the control group, although there was no significant difference between the two groups ( $P > 0.05$ ). Adding Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) did not increase the risk of side effects; thus, it is safe to say that the Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) regimen is safe and reliable. This result is the same as that of Guan *et al.* [16]. They claimed that cervicitis, especially chronic cervicitis, is a common disease in women of childbearing age. Their survey showed that among gynecological infectious diseases, the prevalence of chronic cervicitis was the highest. The main manifestations of chronic cervicitis include increased vaginal discharge, either viscous or purulent, and discomfort over the back, buttock, and during premenstrual period, defecation, and sexual intercourse. The long course of disease seriously affects the physical and mental health of women. In terms of long-term medication, TCM treatment not only has minimal side effects, but also has remarkable effects. *Astragalus* contained in Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) has the effect of invigorating qi, diuresis, and draining pus; *Codonopsis pilosula* invigorates qi, while *Atractylodes macrocephala* strengthens qi, removes water from the body, and promotes excretion; angelica can activate blood and remove stagnation, regulate menstruation, relieve dysmenorrhea, and balance blood qi; cimicifuga can clear away heat and detoxify, raise yang, strengthen the body, and remove dampness; bupleurum has an antipyretic effect, soothing the liver and relieving depression; licorice can nourish the spleen and stomach, restore pulse, and be used to adjust medicines; tangerine peel can regulate qi, strengthen the spleen, dehumidify, and dry; ginger can be used in conjunction with other medicines to achieve better curative effect.

In the treatment of chronic cervicitis of spleen deficiency type, the use of Buzhong Yiqi Decoction (Middle Qi Tonifying Decoction) combined with western medicine can improve the curative effect and reduce the recurrence rate. It is reliable and safe for clinical applications.

### Disclosure statement

The authors declare no conflict of interest.

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# A Clinical Study of Low Molecular Weight Heparin Sodium Injection Combined with Magnesium Sulfate Injection and Labetalol Tablets in the Treatment of Severe Pregnancy-Induced Hypertension

Hongyou Chen\*, Lihua Song, Fei Wang, Yan Gao, Shuang Zhang

The Second Hospital of Chifeng, Chifeng 024000, Inner Mongolia Autonomous Region, China

\*Corresponding author: Hongyou Chen, 15849691798@163.com

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**Abstract:** *Objective:* To investigate the clinical effect of low molecular weight heparin sodium injection combined with magnesium sulfate injection and labetalol in the treatment of severe pregnancy-induced hypertension. *Methods:* A total of 48 patients with severe pregnancy-induced hypertension admitted from February 2021 to February 2023 were selected, and the patients were divided into two groups by simple sampling, with 24 cases in each group. Patients in the control group received labetalol orally and intravenous infusion of magnesium sulfate, whereas those in the observation group received subcutaneous injection of low molecular weight heparin sodium on the basis of the control group. The two groups of patients underwent 5 days of treatment, and the blood pressure control, vascular endothelial function, renal function, and blood coagulation were compared between the two groups. *Results:* Before treatment, there were no significant differences in blood pressure readings, endothelin-1 (ET-1) and nitric oxide (NO) levels, serum creatinine (SCr) and blood urea nitrogen (BUN) levels, and the four coagulation indices between the two groups (all  $P > 0.05$ ). After treatment, the blood pressure readings in the observation group were lower than those in the control group ( $P < 0.05$ ); ET-1 in the observation group was lower than that in the control group, and the NO level in the observation group was higher than that in the control group ( $P < 0.05$ ); compared with the control group, the observation group had lower SCr and BUN ( $P < 0.05$ ), longer prothrombin time (PT), activated partial thromboplastin time (APTT), and thrombin time (TT), and lower fibrinogen (Fib) level ( $P < 0.05$ ). *Conclusion:* Low molecular weight heparin sodium injection combined with magnesium sulfate injection and labetalol in the treatment of severe pregnancy-induced hypertension can help control blood pressure levels, promote the recovery of vascular endothelial function and renal function, and effectively correct coagulation function.

**Keywords:** Severe pregnancy-induced hypertension; Labetalol; Magnesium sulfate; Low molecular weight heparin sodium; Pregnancy outcome

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## 1. Introduction

Pregnancy-induced hypertension (PIH) is a complication during pregnancy, usually occurring after 20 weeks of pregnancy and mainly manifested by hypertension, proteinuria, and edema<sup>[1]</sup>. PIH patients have symptoms of hypertension, along with proteinuria, edema, preeclampsia, and headache, which are the main

causes of maternal and fetal death [2]. Despite a low incidence of severe PIH, this condition has high risk of serious adverse outcomes, thereby garnering widespread clinical attention. At present, the management of severe PIH includes the use of antispasmodics, sedatives, antihypertensives, and diuretics, as well as volume expansion; hence, magnesium sulfate (MS) is often used in the treatment [3]. MS functions by lowering blood pressure, inhibiting uterine smooth muscle contraction, and increasing uterine artery blood flow. However, it is difficult to control blood pressure in severe PIH patients with MS monotherapy, and increasing the drug dose will lead to more adverse reactions, thus threatening the health of both mothers and infants [4]. Therefore, MS is often combined with labetalol (LBT) in clinical practice. LBT is a common antihypertensive drug that selectively blocks  $\beta$ -adrenergic receptors to relax blood vessels, balance myocardial oxygen consumption, and increase cardiac output [5]. As severe PIH is complicated with renal dysfunction, LBT can increase renal blood flow and promote renal function recovery to a certain extent [6]. However, even with the above drugs, it is still difficult to achieve a satisfactory therapeutic effect. Clinical studies have been exploring new treatment options, and research results in recent years have revealed that hypercoagulability is an important manifestation of PIH, and as the condition progresses, the state of hypercoagulability also worsens. Hence, anticoagulant therapy has become a novel approach for the treatment of PIH [7]. In this study, anticoagulation with low molecular weight heparin sodium (LMWH-Na) was added on the basis of MS + LBT treatment.

## **2. Materials and methods**

### **2.1. General information**

Forty-four cases of severe PIH admitted to our hospital from February 2021 to February 2023 were included in the study. The patients were divided into two groups by simple sampling, with 24 cases in each group. Control group: age 24–38 years old (mean  $31.16 \pm 3.86$ ); body weight 55–78 kg (mean  $63.95 \pm 5.15$  kg). Observation group: age 23–38 years old (mean  $31.26 \pm 3.78$  years old); weight 54–79 kg (mean  $64.25 \pm 5.22$  kg). The general data of the two groups of patients were compared, and the two groups were comparable ( $P > 0.05$ ).

Inclusion criteria: (i) patients who met the diagnostic criteria of PIH and whose blood pressure was  $\geq 160/110$  mmHg, in line with the diagnosis of severe disease; (ii) patients and their families who agreed to participate in the study and signed the consent.

Exclusion criteria: (i) patients with liver and kidney dysfunction, primary diseases of the blood system, essential hypertension, bleeding tendency; (ii) patients who had recently received anticoagulant therapy; (iii) patients with other complications during pregnancy; (iv) patients with abnormal fetal development on B-ultrasound.

### **2.2. Treatment methods**

#### **2.2.1. Control group**

Oral LBT (Jiangsu Desano Pharmaceutical Co., Ltd. H32026119 0.1 g) with a dose of 0.1 g/time, twice daily and MS (Tianjin Jinyao Pharmaceutical Co., Ltd. H12020994 10 mL:2.5 g) intravenous drip, 15 g dissolved in 500 mL of 10% glucose solution for injection, and completed within 6–8 h, were prescribed to patients in the control group.

#### **2.2.2. Observation group**

On the basis of LBT + MS as aforementioned, LMWH-Na (Italian ALFASIGMA SpA National Pharmaceutical Approval HJ20140281 0.6 mL:6400 IUaXa) was added at a dose of 5000 IU, subcutaneously, every 12 h.

### 2.2.3. Treatment cycle

Both groups were treated continuously for 5 days, and the therapeutic effect was observed.

### 2.3. Observation indicators

- (i) Blood pressure levels were compared between both groups of patients.
- (ii) The vascular endothelial functions of both groups of patients were compared (ET-1 and NO were detected using a kit from Hefei Laier Biotechnology).
- (iii) The renal functions of both groups of patients were compared (Scr and BUN were detected by radioimmunoassay).
- (iv) The four coagulation indices were compared between both groups (coatron 1800 automatic coagulation analyzer was used).

### 2.4. Statistical analysis

Data were imported into SPSS 22.0 for analysis and processing. Measurement data were represented by mean  $\pm$  standard deviation, and *t*-test was used. Count data were represented by percentage (%), and chi-square test was used.  $P < 0.05$  indicates a statistically significant difference.

## 3. Results

### 3.1. Comparison of blood pressure readings between the two groups

Before treatment, there was no significant difference in blood pressure readings between the two groups ( $P > 0.05$ ). However, after treatment, blood pressure readings in the observation group were lower than those in the control group ( $P < 0.05$ ). See **Table 1** for details.

**Table 1.** Comparison of blood pressure readings between the two groups

Group	Number of cases	Systolic blood pressure (mmHg)		Diastolic pressure (mmHg)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	24	169.51 $\pm$ 7.52	141.82 $\pm$ 8.11	124.06 $\pm$ 6.19	96.81 $\pm$ 6.52
Control group	24	170.46 $\pm$ 8.11	148.89 $\pm$ 8.26	123.71 $\pm$ 6.26	101.83 $\pm$ 6.84
<i>t</i>		0.421	2.992	0.195	2.603
<i>P</i>		0.676	0.004	0.846	0.012

Data are shown in mean  $\pm$  standard deviation.

### 3.2. Comparison of vascular endothelial function indices between the two groups

Before treatment, there were no significant differences in ET-1 and NO levels between the two groups ( $P > 0.05$ ). However, after treatment, the ET-1 level in the observation group was lower than that in the control group, and the NO level in the observation group was higher than that in the control group ( $P < 0.05$ ). See **Table 2** for details.

**Table 2.** Comparison of vascular endothelial function indices between the two groups

Group	Number of cases	ET-1 (mg/L)		NO (mg/L)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	24	88.86 $\pm$ 10.19	61.19 $\pm$ 6.81	52.49 $\pm$ 5.59	68.91 $\pm$ 6.15
Control group	24	89.51 $\pm$ 10.41	70.19 $\pm$ 7.59	53.11 $\pm$ 5.69	62.80 $\pm$ 6.29

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Group	Number of cases	ET-1 (mg/L)		NO (mg/L)	
		Before treatment	After treatment	Before treatment	After treatment
<i>t</i>		0.219	4.324	0.381	3.403
<i>P</i>		0.828	0.000	0.705	0.001

Data are shown in mean ± standard deviation. Abbreviations: ET-1, endothelin-1; NO, nitric oxide.

### 3.3. Comparison of renal function indices between the two groups

Before treatment, there were no significant differences in SCr and BUN levels between the two groups ( $P > 0.05$ ). However, after treatment, the observation group had lower SCr and BUN levels than the control group ( $P < 0.05$ ). See **Table 3** for details.

**Table 3.** Comparison of renal function indices between the two groups

Group	Number of cases	SCr (U/L)		BUN (mmol/L)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	24	60.59 ± 785	41.19 ± 6.82	5.56 ± 0.82	3.22 ± 0.38
Control group	24	61.10 ± 7.91	47.90 ± 7.05	5.64 ± 0.80	4.02 ± 0.41
<i>t</i>		0.224	3.351	0.342	7.011
<i>P</i>		0.824	0.002	0.734	0.000

Data are shown in mean ± standard deviation. Abbreviations: BUN, blood urea nitrogen; SCr, serum creatinine.

### 3.4. Comparison of four coagulation indices between the two groups

Before treatment, there were no significant differences in the four coagulation indices between the two groups ( $P > 0.05$ ). However, after treatment, the observation group had longer PT, APTT, and TT and lower Fib level than the control group ( $P < 0.05$ ). See **Table 4** for details.

**Table 4.** Comparison of four coagulation indices between the two groups

Group	Number of cases	PT (s)		APTT (s)	
		Before treatment	After treatment	Before treatment	After treatment
observation group	24	11.52 ± 0.72	12.86 ± 0.71	25.86 ± 1.91	28.79 ± 1.71
control group	24	11.60 ± 0.74	11.85 ± 0.70	25.56 ± 1.85	26.11 ± 1.84
<i>t</i>		0.380	4.963	0.553	5.227
<i>P</i>		0.706	0.000	0.583	0.000

Group	Number of cases	TT (s)		Fib (g/L)	
		Before treatment	After treatment	Before treatment	After treatment
Observation group	24	16.81 ± 1.56	18.80 ± 1.49	4.25 ± 0.62	3.05 ± 0.45
Control group	24	16.74 ± 1.55	17.15 ± 1.59	4.31 ± 0.61	4.11 ± 0.48
<i>t</i>		0.156	3.710	0.338	7.893
<i>P</i>		0.877	0.001	0.737	0.000

Data are shown in mean ± standard deviation. Abbreviations: PT, prothrombin time; APTT, activated partial thromboplastin time; TT, thrombin time; Fib, fibrinogen.

## 4. Discussion

PIH is a complication during pregnancy. A continuous rise in blood pressure in patients can lead to

decreased cardiac and renal blood flow, which in turn can lead to heart failure, renal dysfunction, *etc.*, and ultimately lead to serious adverse outcomes to both mother and fetus [8]. Previous epidemiological surveys have pointed out that severe PIH poses a significant threat to the life and health of mothers and infants; hence, it is necessary to actively seek more effective treatment options [9]. The conventional treatment for severe PIH is based on the control of blood pressure. As a calcium antagonist, MS can lower blood pressure and, at the same time, enhance the synthesis of prostaglandins and the contraction of skeletal muscle and smooth muscle as well as increase uterine blood flow to prevent eclampsia [10]. In order to achieve a more ideal blood pressure control effect, LBT is jointly used to strengthen the antihypertensive effect, reduce peripheral vascular resistance, and make up for the shortcomings of MS monotherapy.

However, it is still difficult to achieve a very satisfactory therapeutic effect when MS + LBT is used clinically. Hence, other more effective treatment methods are still being explored. Clinical reports have pointed out that the onset of PIH is not only accompanied by elevated blood pressure, but also coagulation dysfunction. The blood of patients with PIH is in a hypercoagulable state, which greatly affects the treatment [11]. Based on this theory, anticoagulant therapy has become a novel approach for the treatment of PIH in recent years. LMWH-Na is a new type of anticoagulant drug, which achieves ideal anticoagulant effect by inhibiting the intrinsic coagulation pathway and accelerating the synthesis of tissue factor pathway inhibitor (TFPI) [12]. Its main component is low molecular weight heparin, which can inactivate blood coagulation factors Xa and IIa and is an ideal anticoagulant drug widely used in recent years [13].

In this study, LMWH-Na was added to the conventional regimen of MS + LBT, and the results showed that a more ideal therapeutic effect was achieved. In the study, the blood pressure readings in the observation group were lower than those in the control group after treatment ( $P < 0.05$ ), suggesting that blood pressure drops significantly after adding LMWH-Na on the ground that it could promote blood circulation and reduce circulatory resistance [14]. In addition, the vascular endothelial function of the observation group also significantly improved; the observation group had lower ET-1 and higher NO than the control group ( $P < 0.05$ ). LBT can dilate blood vessels and promote the repair of vascular endothelial function. Therefore, adding anticoagulant therapy to LBT can reduce vascular resistance and vascular endothelial function damage as well as improve the therapeutic effect of LBT [15]. Renal dysfunction is the main complication of PIH. MS + LBT can lower blood pressure, increase renal blood flow, and promote the recovery of renal function. By adding LMWH-Na to the regimen, blood pressure control and renal function can be further improved. At the end of this study, the four coagulation indices were compared between the two groups. The results showed that the observation group achieved an ideal anticoagulant effect in terms of blood pressure control, vascular endothelial function, and renal function recovery.

In conclusion, adding LMWH-Na on the basis of MS + LBT in patients with severe PIH can further improve the therapeutic effect. Therefore, it should be advocated in clinical practice.

## Disclosure statement

The authors declare no conflict of interest.

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# Observation on the Application Effect of Bedside Nursing Mode of Mother-Infant Rooming-in High-Quality Obstetric Care

Nana Li\*, Jianping Fan

Jinan Maternity and Child Care Hospital Affiliated to Shandong First Medical University, Jinan 250001, Shandong Province, China

\*Corresponding author: Nana Li, nanali2013@sina.com

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**Abstract:** *Objective:* To observe the application effect of bedside nursing mode of mother-infant rooming-in in high-quality obstetric care. *Methods:* Selected mothers (60 cases) from our hospital (January 2022–December 2022) were recruited and randomly divided into two groups (30 cases/group). The effects were compared between the routine nursing mode (control group) and the bedside nursing mode of mother-infant rooming-in (observation group). *Results:* Compared with the control group, the observation group scored higher in health education knowledge, and the total satisfaction was higher than that of the control group ( $P < 0.05$ ). *Conclusion:* The bedside nursing mode of mother-infant rooming-in can improve mothers' parenting skills and lay a foundation for post-discharge parenting. This nursing mode is novel and effective and has significant advantages in reducing anxiety while protecting mothers and babies.

**Keywords:** Mother-infant rooming-in; Bedside nursing mode; Obstetrics; High-quality nursing

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## 1. Introduction

Obstetric care involves both pregnant women and fetuses. The service content can be challenging due to its complexity and changeability, high requirements and difficulties, various disputes, as well as the uneven quality and ability of nursing staff. The quality of obstetric nursing work is directly related to medical quality and safety [1]. Therefore, the sustainable improvement of high-quality obstetric care is necessary and imperative. Bedside nursing comprehensive care is a family-centered and high-quality service to ensure the health of mothers and babies [2]. It is highly encouraged for obstetrics to adopt the bedside nursing mode of mother-infant rooming-in to provide warm and compassionate services for mothers during puerperium (also known as postpartum) [3,4]. The purpose of this study was to explore the effectiveness of the mother-infant bedside nursing mode in obstetric care. This model includes newborn bathing, stroking, disease screening, breastfeeding guidance, health education, and vaccinations, allowing mothers to completely supervise the behavior of nursing staff. A total of 60 cases of mothers who recently gave birth in our hospital were selected to implement the nursing model, and the reports after the implementation were collected and analyzed.

## 2. Materials and methods

A retrospective study was carried out from January 2022 to December 2022 at Jinan Maternity and

Childcare Hospital Affiliated with Shandong First Medical University, China. The inclusion criteria included mothers with abnormal pregnancies judged by clinicians, complete medical records, as well as normal mental and consciousness. The exclusion criteria included mothers withdrawing before the end of the study due to various reasons, those with communication problems, and those who had malignant tumors or  $\geq 2$  fetuses. Sixty mothers who fulfilled the inclusion criteria were recruited and informed, signed the consent form, and were randomly divided into two groups, the control group that received routine nursing, and the observation group that was under the bedside nursing mode of mother-infant rooming-in. The upper and lower age limits of the control and observation group were 20–35 and 21–35 years old, respectively, and the mean age was  $27.54 \pm 4.28$  years old and  $28.17 \pm 4.25$  years old, respectively; the difference between the two groups was small and insignificant ( $P > 0.05$ ).

For the control group, the routine nursing mode was used to popularize puerperium-related knowledge to mothers and their families, allowing the nursing staff to understand the current state of mind of mothers, comfort and encourage mothers, mobilize maternal breastfeeding confidence, provide reasonable advice and supervision on drug treatment and daily diet to mothers, maintain a clean, safe, and comfortable hospital environment to improve the comfort of mothers, provide professional consulting services for mothers, as well as assist mothers to overcome various problems encountered during puerperium.

For the observation group, the bedside nursing mode of mother-infant rooming-in was used. In order to ensure the comprehensiveness of neonatal care, the nursing staff completed all nursing operations related to the mother. Therefore, the comprehensive quality of the nursing staff was strengthened, where delivery knowledge training was carried out regularly and the work quality and service attitude of the obstetric nursing staff improved. The bedside nursing mode enhances the sense of professional responsibility and continues to expand the knowledge of professional nursing and health education, ensuring that nursing behaviors comply with the standard of practice. Strengthening education on maternal health, disseminating relevant knowledge about childbirth, and conveying precautions for bedside nursing care of mothers and infants allowed improvement of the mothers' and newborns' health. The bedside nursing mode included personalized care plans for mothers depending on their actual needs, as well as the implementation of newborn vaccination and disease screening according to the family doctor's recommendations. Meanwhile, mothers were reminded to maintain personal hygiene, a reasonable diet, and moderate exercise. Their body temperature, abdomen, incisions, breasts, skin, *etc.*, were regularly checked, along with the recovery of the uterus. They were guided in physical training, and any breastfeeding problems were promptly corrected. Mothers and their families were able to obtain detailed postpartum nutrition introduction and operation demonstration. Maternal and newborn care including vaccination, bedside bathing, daily touching, intellectual protection training, bedside disease screening, and health education was given to ensure good health.

The effect judgment of the study was as follows:

- (1) Mastery of health education knowledge: Each item was scored from 0 to 100 points; the higher the score, the higher the level of health education;
- (2) Nursing satisfaction: A questionnaire survey was carried out; those who scored less than 60 points were judged as dissatisfied, those who scored more than 60 points but less than 90 points were judged as generally satisfied, and those who scored 90 points and above were judged as satisfied; those that fell under dissatisfied were excluded, and the remaining statistics represented total satisfaction.

Statistical software SPSS 22.0 was used to process data. The measurement data were represented by mean  $\pm$  standard deviation (SD), and the *t*-test was used. Enumeration data were expressed in percentage (%), and the  $\chi^2$  test was used. The probability  $P < 0.05$  indicated a statistically significant difference.

### 3. Results

#### 3.1. Scoring of health education knowledge mastery

As shown in **Table 1**, the health education knowledge score of the observation group was higher as compared to the control group ( $P \leq 0.001$ ).

**Table 1.** Knowledge of health education

Group	Number of cases	Massage on newborn	Bathing	Breastfeeding	Postpartum nutrition
Observation group	30	96.87 ± 12.18	95.35 ± 13.48	95.87 ± 2.23	97.34 ± 1.28
Control group	30	84.54 ± 11.04	84.44 ± 10.47	79.85 ± 2.24	80.64 ± 2.20
<i>t</i>		4.108	3.5010	27.761	35.937
<i>P</i>		0.000	0.001	0.000	0.000

#### 3.2. Comparison of nursing satisfaction between the two groups

**Table 2** shows the total nursing satisfaction of the two groups, where the observation group was higher than that of the control group (100% versus 70%,  $P = 0.001$ ).

**Table 2.** Comparison of nursing satisfaction between the two groups

Group	Number of cases	Satisfied	Generally satisfied	Dissatisfied	Total satisfaction
Observation group	30	23 (76.67%)	7 (23.33%)	0 (0.00%)	30 (100.00%)
Control group	30	14 (46.67%)	7 (23.33%)	9 (30.00%)	21 (70.00%)
$\chi^2$		5.711	0.000	10.588	10.588
<i>P</i>		0.017	1.000	0.001	0.001

### 4. Discussion

Fertility is an extremely important physiological process, especially for primiparous women, who not only need to recover their bodies quickly but also adapt to the role of mothers. Such complex changes are often difficult to deal with [5,6]. Additionally, new mothers are often insecure due to a lack of knowledge about newborn care. Traditional clinical nursing often uses a centralized education method to gather all newborns into one bathing room for bathing and nursing. However, this method hinders mothers from fully grasping the health knowledge and skills related to babies; hence, this needs to be improved [7]. Therefore, our hospital has developed the bedside nursing mode to help new mothers adapt to their role, reduce depressive symptoms, and make nursing closer to the clinic. The bedside nursing mode of mother and baby sharing a bed further improves maternal satisfaction and promotes communication and contact between nurses and mothers. For traditional tertiary-level nursing, bedside care is more comprehensive. During the perinatal period, we adopt the bedside nursing mode, which not only avoids the traditional operation of mother-infant separation nursing but also effectively promotes the touching and bathing of newborns [8,9]. Dividing care into different modes has the potential to reduce opportunities for communication with patients, shorten maternal-infant contact, and distort the nature of care. Modern medicine attaches great importance to humanistic nursing, which also increases people's demand for health. In clinical medicine, the concept of humanization has been widely used. Maternal women want to have control over their situation and the right to make their own choices. Bedside care in the same room can protect the rights of mothers without separating mothers and babies, while it helps mothers learn knowledge and skills about baby care and health care, so mothers are willing to accept this mode. In order to improve the professionalism of the medical

staff, obstetric nurses need to provide thoughtful service and effective communication with patients to help them find peace. They must be proficient in technology, enrich their professional knowledge, and constantly improve their quality. Bedside care helps nurses grow closer to patients while strengthening their clinical practice of humanistic care. Meanwhile, continuing in-depth study of neonatal nursing knowledge is also essential for nurses, so that they can combine theory and practice with operational skills, as well as master them proficiently, which then helps mothers change smoothly <sup>[10,11]</sup>.

Firstly, the nurse-in-charge will demonstrate various nursing methods for newborns, such as changing diapers, bathing, buttocks, and umbilical care, so that family members can learn and master the correct skills. Bedside care facilitates mother-infant interaction, family care, and the transfer of parenting experiences. The mother's sense of participation and responsibility can be effectively strengthened, while anxiety and stress can be relieved. In addition, through bedside care, mothers can adapt to the newborn's lifestyle faster, improve parenting confidence, and successfully pick up the proper role as a mother. Breastfeeding, bathing, and other methods can effectively promote emotional communication between mother and child. Moreover, relevant knowledge can also help mothers understand neonatal diseases and improve nursing safety. The use of "one-to-one" bedside care not only increases communication opportunities but also solves the doubts of mothers and family members; thus, it is worthy of widespread application in clinical practice <sup>[12,13]</sup>.

The study found significant differences in the way patients received care between the two groups. Through bedside care, nurses can be closer to the actual situation and communicate more closely with mothers. However, traditional obstetric care services are staged according to different service objects, separating mothers and infants into different service modes, such as bathing, massage, and treatment. This leads to the interruption of nursing continuity and the emergence of communication barriers, which cannot realize humanized comprehensive nursing well. Today, people's demand for health care is increasing, including the right to know, the right to choose, the right to participate, the right to family care, and the right to personal privacy. Bedside care prevents the separation of mother and baby as much as possible, as well as maximizes the protection of multiple rights and interests of mothers and their families; hence, they are highly expected and popular in society. Under the guidance and assistance of nursing staff, the nursing relationship between mothers and babies is more harmonious, and the quality of nursing can also be improved. Nurses' professional knowledge, comprehensive services, and excellent technology have won the trust and recognition of mothers, which has greatly improved their satisfaction with nursing services <sup>[14,15]</sup>. The results of the study showed that patients in the observation group who received health education had better knowledge than those in the control group who did not receive any education. This is because the nurses in charge of bedside care for mothers and infants provided demonstration, explanation, guidance, and practical operations, as well as encouraged the mothers and family members to actively participate, thereby realizing the mastery of self-care and parenting skills. Carrying out periodic planned health education and avoiding excessive publicity for mothers are conducive to mastering the key points of education in stages and improving the effect of postpartum education. The teaching method combined with maternal operation is more effective than the traditional mother-infant care mode.

The quality of obstetric nursing work is directly related to medical quality and medical safety, and it is related to society's satisfaction with hospitals and medical staff. The obstetric nursing work is special, changeable, difficult, and highly disputed. With the improvement of living standards and the emergence of advanced maternal age, the requirements for obstetric care continue to rise. By implementing the "people-oriented" principle, we can continue to improve high-quality obstetric care services through the bedside care model of mothers and babies <sup>[16]</sup>, as it increases patients' satisfaction and trust in the hospital and medical staff, improves word-of-mouth, makes patients feel happy and recover quickly, shortens hospitalization time, reduces the economic pressure of individuals, families, and society, and generates

good social and economic benefits. Nursing staff in hospitals who find their deficiencies at work improve through learning and training from the nursing echelon with high-level nursing knowledge and talents. This promotes the rapid development of the hospital. The management mode of the hospital reduces internal friction in work and resistance to facilitate the smooth development of various tasks and the rapid development of the hospital, acquires sustainable improvement experience in clinical nursing, builds a nursing team and brand, and provides valuable experience and reference for the nursing work of the whole hospital and even outside the hospital.

#### **4. Conclusion**

In summary, the bedside care model of mother-infant rooming-in has several benefits. It improves patient satisfaction and helps family members master the key points of newborn care. During the implementation of nursing care, mothers can be self-aware of the transformation of roles and regain confidence in baby care, thereby improving their sense of responsibility. Meanwhile, nursing staff should pay attention to their emotional state at any time, find out the reasons for their psychological changes, and provide specific guidance and related support.

#### **Disclosure statement**

The authors declare no conflict of interest.

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# Guishen Yugong Decoction Combined with Sequential Hormone Replacement Therapy in the Treatment of Premature Ovarian Failure and Its Effect on Serum Sex Hormones

Limei Qin\*, Jiatong Qin

Inner Mongolia Bai Cao Tang Qin's Traditional Chinese and Mongolian Medicine Hospital, Hohhot 010030, Inner Mongolia Autonomous Region, China

\*Corresponding author: Limei Qin, 15853655969@163.com

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**Abstract:** *Objective:* To analyze the therapeutic effect of Guishen Yugong Decoction + sequential hormone (estrogen and progesterone) replacement therapy and its effect on serum sex hormones in patients with premature ovarian failure. *Methods:* From July 2020 to July 2022, 100 patients with premature ovarian failure were included in the study. Random number table method was used to divide the patients into groups: the control group received sequential hormone replacement therapy, whereas the treatment group received Guishen Yugong Decoction + sequential hormone replacement therapy. The curative effect, traditional Chinese medicine (TCM) syndrome scores, serum sex hormone levels, and incidence of adverse reactions of both groups of patients were compared. *Results:* The total effective rate in the treatment group was higher than that in the control group,  $P < 0.05$ ; the TCM syndrome scores in the treatment group were lower than those in the control group,  $P < 0.05$ ; the serum sex hormone indices in the treatment group were better than those in the control group ( $P < 0.05$ ); the treatment group had lower incidence of adverse reactions, as compared to the control group ( $P < 0.05$ ). *Conclusion:* Guishen Yugong Decoction + sequential hormone replacement therapy can regulate serum sex hormone levels and relieve symptoms of premature ovarian failure. This treatment is not only effective, but also safe for clinical use.

**Keywords:** Premature ovarian failure; Estrogen and progesterone; Guishen Yugong Decoction; Serum sex hormones; Curative effect

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## 1. Introduction

Premature ovarian failure (POF) is typically characterized by amenorrhea, but some patients may present with other symptoms, such as loss of libido, flushing, and infertility. POF is defined as primary ovarian defect occurring before the age of 40 in women with normal menarche. The incidence of POF is high [1]. POF can affect the endocrine system, resulting in decreased estrogen and increased gonadotropin; in long term, disorders of the endocrine system can induce cardiovascular disease, osteoporosis, and threaten the patient's physical and mental health. At present, hormone replacement therapy is widely used in western medicine to treat POF. It can effectively relieve POF symptoms, but the risk of adverse reactions after long-term medication is high; moreover, relapse may occur after stopping medication [2]. TCM treatment of patients with premature ovarian failure is based on the holistic concept of dialectical treatment. It makes up

for the shortcomings of simple western medicine, is conducive to the recovery of ovarian function, and prevents adverse drug reactions. In this study, 100 POF patients admitted from July 2020 to July 2020 were enrolled to explore the therapeutic effect of Guishen Yugong Decoction + sequential hormone replacement therapy.

## 2. Materials and methods

### 2.1. Baseline data

From July 2020 to July 2022, 100 patients with POF were included in this study. They were grouped by random number table. Baseline data of the control group: age 25–39 (mean  $34.19 \pm 2.43$ ) and course of disease 3 months to 3 years (mean  $1.44 \pm 0.41$  years). Baseline data of the treatment group: age 25–39 (mean  $34.21 \pm 2.39$ ) and course of disease 4 months to 3 years (mean  $1.38 \pm 0.39$  years). There was no difference in baseline data between both groups of patients ( $P > 0.05$ ).

### 2.2. Diagnostic, inclusion, and exclusion criteria

Diagnostic criteria: western medicine “Gynecology and Obstetrics of Traditional Chinese Medicine” [3] standard (amenorrhea for more than 6 months, and serum follicle stimulating hormone [FSH]  $> 40$  mIU/mL two consecutive times); TCM “Guiding Principles for Clinical Research of New Drugs of Traditional Chinese Medicine” [4] standard (kidney deficiency and blood stasis syndrome, pale tongue with thin fur, deep and thready pulse, amenorrhea, insomnia, backache, soft knees, and abdominal pain).

Inclusion criteria: (i) patients under 40 years old; (ii) informed consent given; (iii) approved by the research ethics committee.

Exclusion criteria: (i) patients with pituitary tumors or polycystic ovaries; (ii) patients with organ dysfunction; (iii) patients who self-medicated before enrollment.

### 2.3. Treatment methods

Sequential treatment with estrogen and progesterone in the control group: estradiol valerate tablets (Bayer Healthcare Co., Ltd.) taken for 5 days of menstruation, 1 mg orally before dinner, once a day, and continued for 21 days; progesterone capsules (Zhejiang Pharmaceutical Co., Ltd. Xinchang Pharmaceutical Factory) taken for 20 days at a single dose of 100 mg, twice a day continuously for 5 days. The patients underwent three courses of treatment, each of which lasted for one menstrual cycle.

Shenyugong Decoction + sequential treatment with estrogen and progesterone in the treatment group: same regimen of estrogen and progesterone as that of the control group; Shenyugong Decoction prescription (*Cuscuta* 20 g, *Poria cocos* 15 g, Chinese yam 15 g, *Spatholobus* 15 g, *Radix Polygoni Multiflori Preparata* 15 g, charred hawthorn 15 g, himalayan teasel root 12 g, *Lycium barbarum* 12g, *Eucommia* 10 g, *Cornu Cervi Degelatinatum* 10 g, *Cornus*, *Rehmannia* 10 g, *Placenta Hominis* 10 g, and prepared licorice 6 g), 1 dose (400 mL decoction) in the morning and evening for 3 months.

### 2.4. Evaluation indicators

- (i) Efficacy: markedly effective (menses resumed, normalized FSH, estradiol [E<sub>2</sub>], and luteinizing hormone [LH], and TCM syndrome scores decreased by  $\geq 95\%$ ); effective (increased menstrual flow, improvement in sex hormones, and TCM syndrome scores decreased by 30%–94%); or ineffective (amenorrhea, no improvement in sex hormones, and TCM syndrome scores remained unchanged).
- (ii) TCM syndrome scores: 4 domains (lower abdominal pain, dizziness and tinnitus, insomnia, and soreness over the waist and knees); each domain scored based on the degree of symptoms (0 = none, 1 = mild, 2 = moderate, and 3 = severe).

- (iii) Serum sex hormones: FSH, E<sub>2</sub>, and LH detected by a fully automatic chemiluminescent instrument.
- (iv) Incidence of adverse reactions: Nausea and vomiting, skin itching, and breast tenderness were recorded.

## 2.5. Statistical analysis

The data of the patients were processed by SPSS 21.0. Count data were recorded as percentage (%), and  $\chi^2$  test was performed. Measurement data were recorded as mean  $\pm$  standard deviation, and *t*-test was performed.  $P < 0.05$  indicates statistically significant test result.

## 3. Results

### 3.1. Curative effect

The total effective rate in the treatment group was higher than that in the control group,  $P < 0.05$ , as shown in **Table 1**.

**Table 1.** Curative effect analysis

Group	Markedly effective	Effective	Ineffective	Total effective rate
Treatment group (n = 50)	41 (82.0)	8 (16.0)	1 (2.0)	98.0
Control group (n = 50)	35 (70.0)	8 (16.0)	7 (14.0)	86.0
$\chi^2$	–	–	–	4.8913
<i>P</i>	–	–	–	0.0270

Data are given as n (%).

### 3.2. TCM syndrome score

After treatment, the syndrome scores of the treatment group were lower than those of the control group,  $P < 0.05$ , although the differences in scores were not significant before treatment,  $P > 0.05$ . See **Table 2** for details.

**Table 2.** TCM syndrome analysis

Group	Abdominal pain		Dizziness and tinnitus	
	Before treatment	After treatment	Before treatment	After treatment
Treatment group (n = 50)	2.62 $\pm$ 0.81	0.73 $\pm$ 0.36	2.71 $\pm$ 0.83	0.69 $\pm$ 0.38
Control group (n = 50)	2.59 $\pm$ 0.76	1.34 $\pm$ 0.49	2.74 $\pm$ 0.85	1.31 $\pm$ 0.44
<i>t</i>	0.1910	7.0940	0.1786	7.5408
<i>P</i>	0.8489	0.0000	0.8587	0.0000
Group	Insomnia		Soreness over the waist and knees	
	Before treatment	After treatment	Before treatment	After treatment
Treatment group (n = 50)	2.51 $\pm$ 0.72	0.74 $\pm$ 0.42	2.66 $\pm$ 0.74	0.78 $\pm$ 0.39
Control group (n = 50)	2.49 $\pm$ 0.69	1.41 $\pm$ 0.79	2.61 $\pm$ 0.76	1.43 $\pm$ 0.61
<i>t</i>	0.1418	5.2952	0.3333	6.3482
<i>P</i>	0.8875	0.0000	0.7396	0.0000

Data are given as mean  $\pm$  standard deviation.

### 3.3. Serum sex hormones

Although the difference in FSH, E<sub>2</sub>, and LH levels of patients in the treatment group and the control group was insignificant before treatment ( $P > 0.05$ ), the difference was significant after treatment, whereby the

sex hormones of patients in the treatment group were better than those in the control group ( $P < 0.05$ ). See **Table 3** for details.

**Table 3.** Serum sex hormone level analysis

Group	FSH (mIU/mL)		E <sub>2</sub> (pg/mL)		LH (mIU/mL)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Treatment group (n = 50)	53.87 ± 2.41	30.61 ± 1.69	31.24 ± 1.87	52.87 ± 2.08	31.27 ± 1.87	20.39 ± 1.51
Control group (n = 50)	53.91 ± 2.39	38.11 ± 1.84	31.22 ± 1.85	45.69 ± 1.96	31.29 ± 1.84	25.11 ± 1.69
<i>t</i>	0.0833	21.2273	0.0538	17.7644	0.0539	14.7267
<i>P</i>	0.9338	0.0000	0.9572	0.0000	0.9571	0.0000

Data are given as mean ± standard deviation.

### 3.4. Incidence of adverse reactions

The incidence of adverse reactions in the treatment group was significantly lower than that in the control group ( $P < 0.05$ ), as shown in **Table 4**.

**Table 4.** Analysis of incidence of adverse reactions

Group	Feel unwell and vomiting	Itchy skin	Breast tenderness	Incidence rate
Treatment group (n = 50)	1 (2.0)	0 (0.0)	0 (0.0)	2.0
Common group (n = 50)	3 (6.0)	2 (4.0)	1 (2.0)	12.0
$\chi^2$	–	–	–	
<i>P</i>	–	–	–	

Data are given as n (%).

## 4. Discussion

POF is related to long-term estrogen deficiency-induced genital atrophy. If not treated early, it can lead to bone loss, affect blood lipid metabolism, and increase the risk of osteoporosis and cardiovascular disease, thus affecting women's physical and mental health. At present, the specific cause of POF is not known. It is believed that the disease is related to multiple factors, such as immunity, genetics, history of ovarian surgery, infection, and lack of synthetic enzymes [5]. According to relevant literature reports, once POF occurs, the growth of interstitial fibers in the patient's body increases, the estrogen level decreases, and the vascular lumen becomes thinner, which in turn reduces the compliance of the vessel wall, increases blood flow and vascular resistance, causes a reduction in ovarian volume, and induces amenorrhea [6]. Another literature has reported that the pathophysiology of POF involves a decrease in ovarian reserve function, manifested as a decrease in FSH levels [7]. In the treatment of POF with western medicine, medications are used to relieve symptoms. For example, estrogen and progesterone replacement therapy can effectively improve POF symptoms, but their long-term administration can increase the risk of endometrial cancer and breast cancer; in addition, relapse may occur once the treatment stops [8]. In TCM theory, POF belongs to the category of "infertility" and "amenorrhea" and is related to the deficiency of essence and blood, kidney essence deficiency, etc. Amenorrhea is believed to occur when the blood sea cannot be filled [9]. In this paper, Guishen Yugong Decoction is used for treatment. In the prescription, *Cuscuta* can consolidate essence and strengthen yang, as well as nourish the liver and the kidney; Chinese yam can nourish the kidney and essence; Poria can calm the heart and strengthen the spleen; charred hawthorn can remove blood

stasis and promote blood circulation; *Eucommia ulmoides*, himalayan teasel root, *Lycium barbarum*, and *Cornus* can also nourish the liver and the kidney; *Rehmannia glutinosa* can nourish the blood and yin; while *Cornu Cervi Degelatinatum* can aid yang and warm the kidney. Guishen Yugong Decoction combined with various prescriptions plays a role in nourishing the blood and yin, replenishing essence, tonifying the kidney, soothing the liver, regulating menstruation, removing blood stasis, and promoting blood circulation [10-12].

According to our analysis, the total effective rate in the treatment group was significantly higher than that in the control group; the syndrome scores of POF patients in the treatment group were significantly lower than those of patients in the control group; the FSH, E<sub>2</sub>, LH levels of patients in the treatment group were significantly better, as compared to those in the control group. Hence, it is suggested that Guishen Yugong Decoction + sequential hormone replacement therapy has a better effect in treating POF in terms of regulating the levels of sex hormones and improving symptoms. Analyzing the reasons, western medicine sequential therapy can solve the problem from the source with the addition of Guishen Yugong Decoction, as the synergistic effect of various TCMS includes tonifying the kidney and strengthening the spleen, as well as regulating the body's immune function and endocrine function. This effect is conducive to the recovery of the patient's ovarian function [13]. Combined with modern pharmacological analysis, in Guishen Yugong Decoction, *Cuscuta* is rich in total flavonoids, which can stimulate follicle development, regulate estrogen levels, and thus promote the recovery of ovarian function; *Rehmannia glutinosa* can stimulate hematopoiesis; Chinese yam can induce endometrial thickening, regulate sex hormone levels, correct hormone secretion disorders, delay ovarian function decline, and shorten the recovery time; *Lycium barbarum* is rich in polysaccharides, trace elements, amino acids, and other substances, which can regulate the secretion of hormones and enhance the body's immune function [14]. Our data also showed that the incidence of adverse reactions in the treatment group was significantly lower than that in the control group, suggesting that Guishen Yugong Decoction + sequential hormone replacement therapy is safer in treating POF. Analyzing the reason, western medicine sequential therapy can stimulate the development of female genitalia, reduce bone loss, and reduce the risk of osteoporosis. However, long-term use of estrogen-progesterone therapy can damage kidney function and increase the risk of ovarian cancer. The safety of hormonal therapy is dubious. However, when combined with Guishen Yugong Decoction, it works synergistically to effectively regulate qi and blood, thereby optimizing sex hormone levels and improving ovarian function. This is beneficial to the prognosis of patients [15].

In conclusion, Guishen Yugong Decoction + sequential hormone replacement therapy with estrogen and progesterone in the treatment of POF can effectively regulate the levels of sex hormones, improve the symptoms of POF, and promote the recovery of ovarian function. Therefore, it has clinical value in the treatment of POF.

### Disclosure statement

The authors declare no conflict of interest.

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## Journal

*Journal article (print) with one to three authors*

[1] Yao Y., Xia B. Application of Phase Frequency Feature Group Delay Algorithm in Database Differential Access. *Computer Simulation*, 2014, 31(12): 238-241.

*Journal article (print) with more than three authors*

[2] Gamelin F.X., Baquet G., Berthoin S., et al. Effect of high intensity intermittent training on heart rate variability in prepubescent children. *European Journal of Applied Physiology*, 2009, 105: 731–738.

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## **Book**

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[5] Schneider Z., Whitehead D., Elliott D. Nursing and midwifery research: methods and appraisal for evidence-based practice. 3rd edn. 2009, Elsevier Australia, Marrickville, NSW.

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[6] Davis M., Charles L., Curry M.J., et al. Challenging spatial norms. 2013, Routledge, London.

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[7] Knowles M.S. Independent study. In Using learning contracts. 1986, Jossey-Bass, San Francisco, 89–96.

## **Others**

### *Proceedings of meetings and symposiums, conference papers*

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[13] Standards Australia Online. Glass in buildings: selection and installation. AS 1288–2006. 2006, SAI Global database.

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*No author*

[16] Guide to agricultural meteorological practices. 2nd edn, Secretariat of the World Meteorological Organization, 2010, Geneva.

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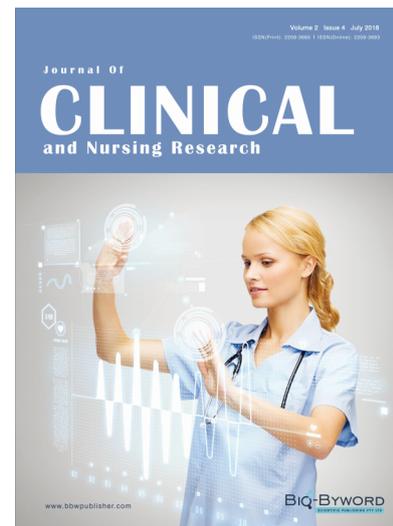
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